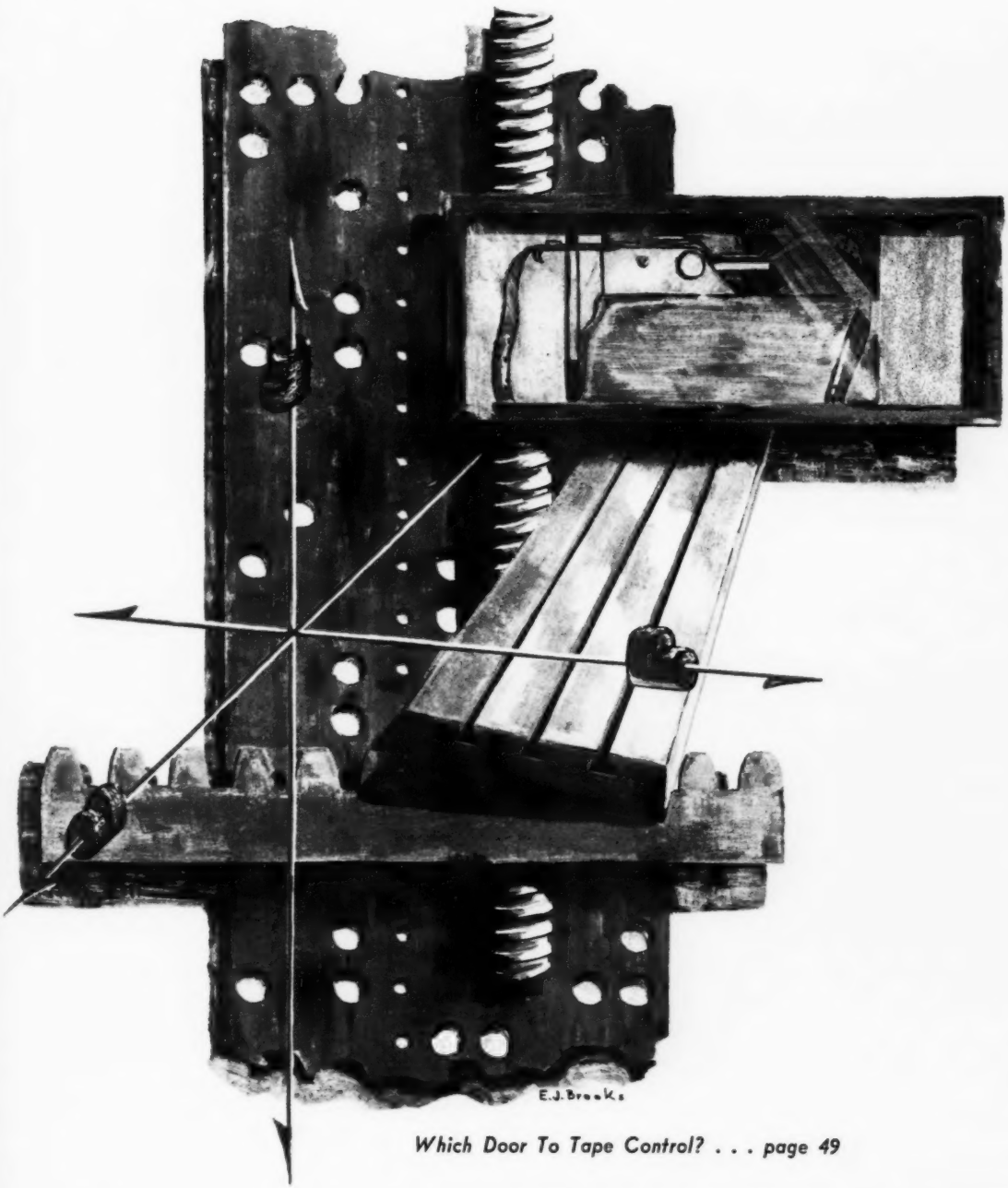
TOOLING & PRODUCTION

JANUARY 1961

The Magazine of Metal Working Methods



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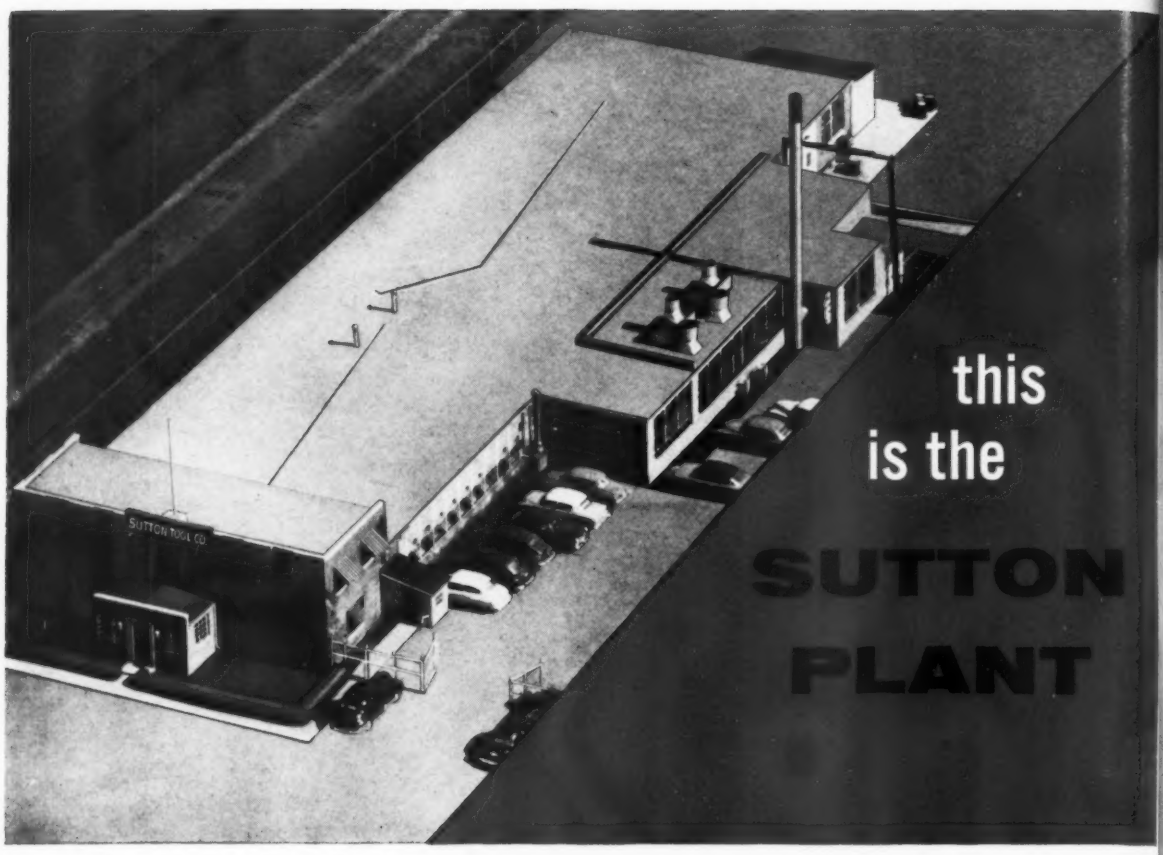

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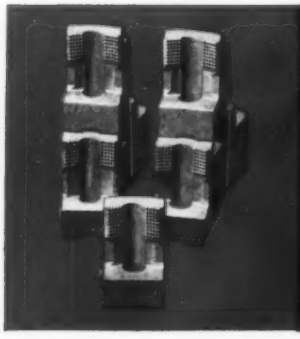

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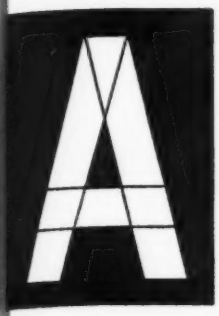

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TOOLING & PRODUCTION Magazine

VOL. XXVI, No. 10
JANUARY 1961

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TOOLING & PRODUCTION MAGAZINE

Vol. XXVI, No. 10 George J. Huebner, Founder 1885-1956

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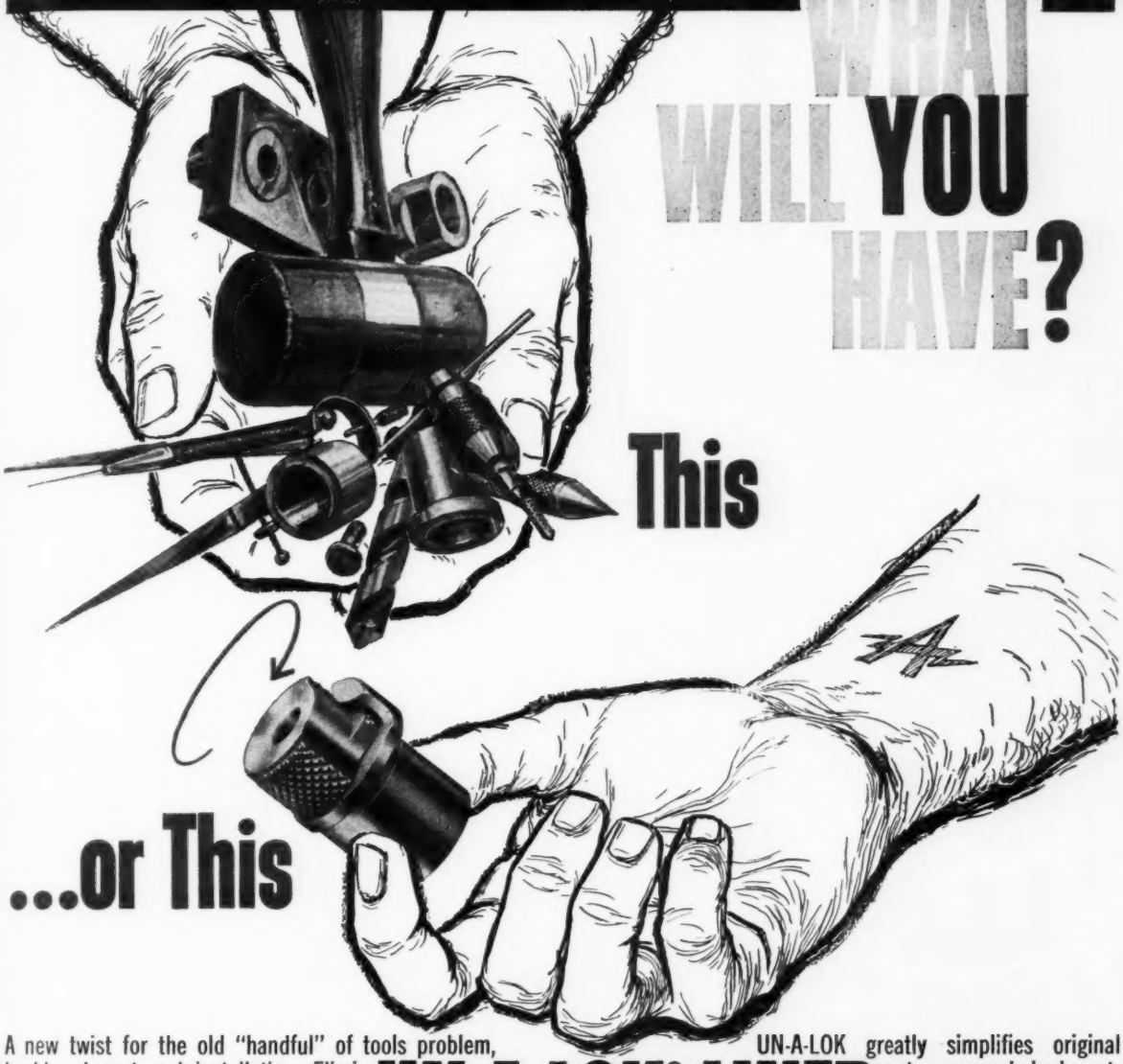
WHAT WILL YOU HAVE?



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JANUARY 1961
VOL. XXVI, No. 10
GEORGE J. HUEBNER, Founder
1885 - 1956

personally speaking...

Dear T & P Reader:

Before getting into some things I want to tell you about, let me wish you a Happy New Year. I hope 1961 will fulfill your greatest expectations.

This issue of Tooling & Production will have a greatly exploded circulation. New readers of this issue will be men who attended the industrial shows which were held in Chicago in September of 1960. If you are one of these new readers, I welcome you to Tooling & Production. If you feel that this magazine received regularly would be of value and benefit in your work, ask us for it and we will tell you what your qualifications must be to receive it regularly at no charge.

To all readers of this first issue of 1961, I recommend two very important articles. One of these, entitled "Which Door to Tape Control?" was prepared by "Chuck" Weiner, a T&P Associate Editor, who did much research work to come up with a very fundamental and objective report. I believe that this article will help you to make up your mind whether or not to consider tape control and which ways to go if your decision on this question is affirmative. You will quickly observe that the article has quotes from many authorities on the subject of tape control. And it does a good job of dealing with the question of retrofit. After you read this article, we'll be most interested in receiving comments, questions or opinions from you.

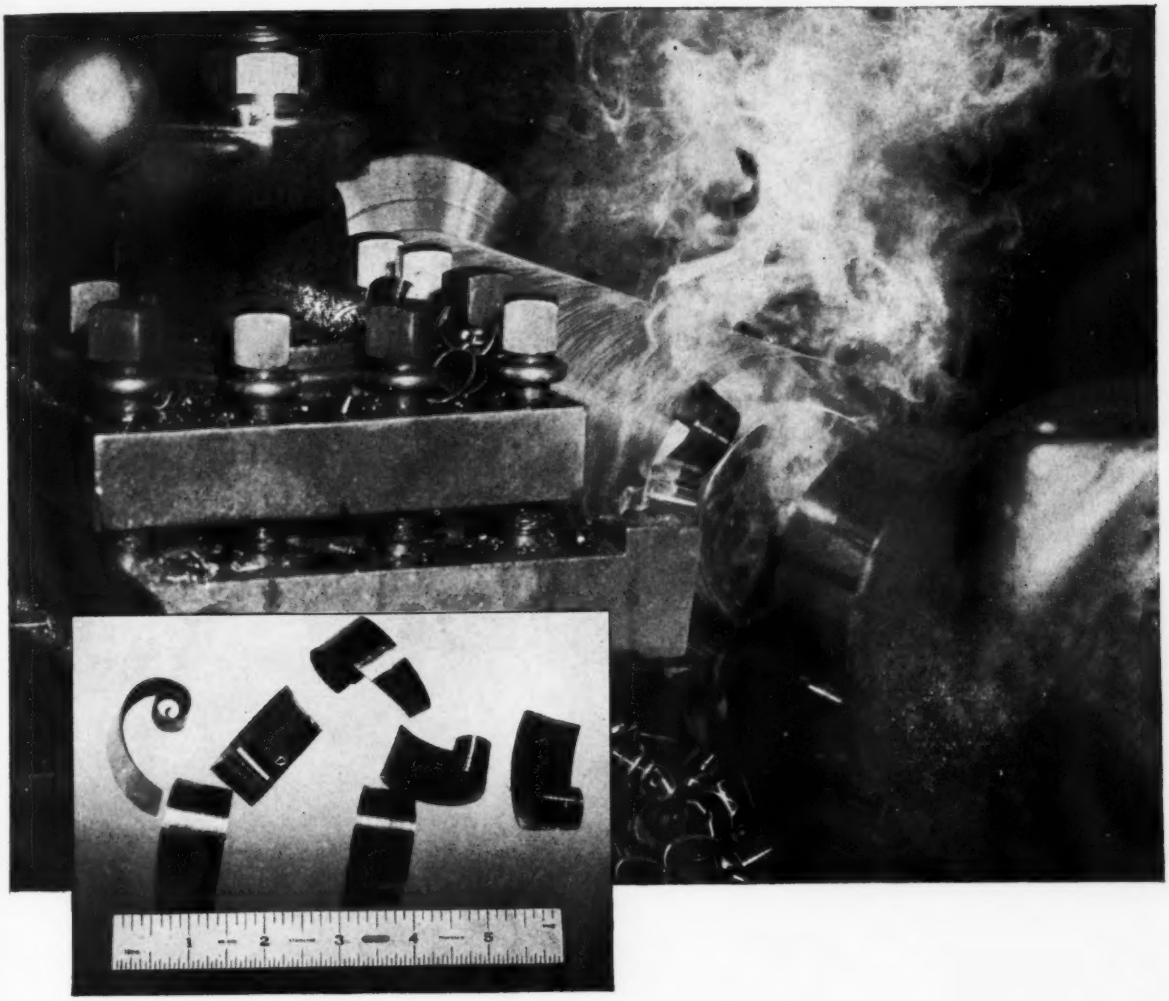
The other article that I'm sure you will not want to miss is reported by Baxter T. Fullerton, Director of Marketing Services at Warner & Swasey Company. This article of Mr. Fullerton's is the first of a series, all on the same general subject of depreciation. This first article is basically an introduction and deals with depreciation and obsolescence but also with the very important factor of deterioration. There is much in this article descriptive of how to get the most out of the depreciation formula which you may now be using. I'm sure you can benefit from reading this series of articles. I urge you not to miss any of them.

A couple of weeks after this issue of T&P reaches readers, a group of five to six hundred readers will receive an additional copy of the issue with a request to mark selected items in it and return the marked copy to us. This is a research activity which will be of great importance for guiding us as well as advertisers. If you happen to be one of the readers who is asked to provide the information that will be called for by this study, we hope you will give it the quickest and fullest attention that you can. The time required of you will be very small and your assistance will be of inestimable value to us and to all readers and advertisers. We'll be most appreciative of your assistance and cooperation.

Cordially yours,

Ray Huebner

Publisher



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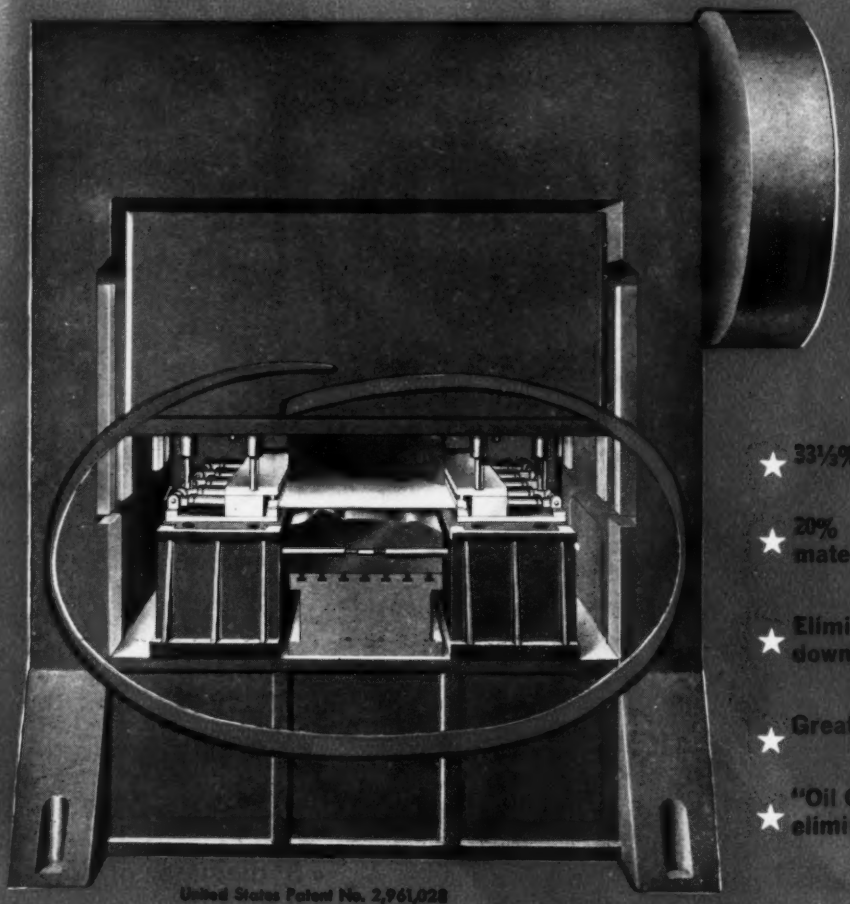

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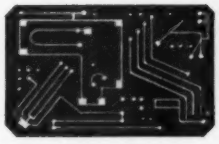

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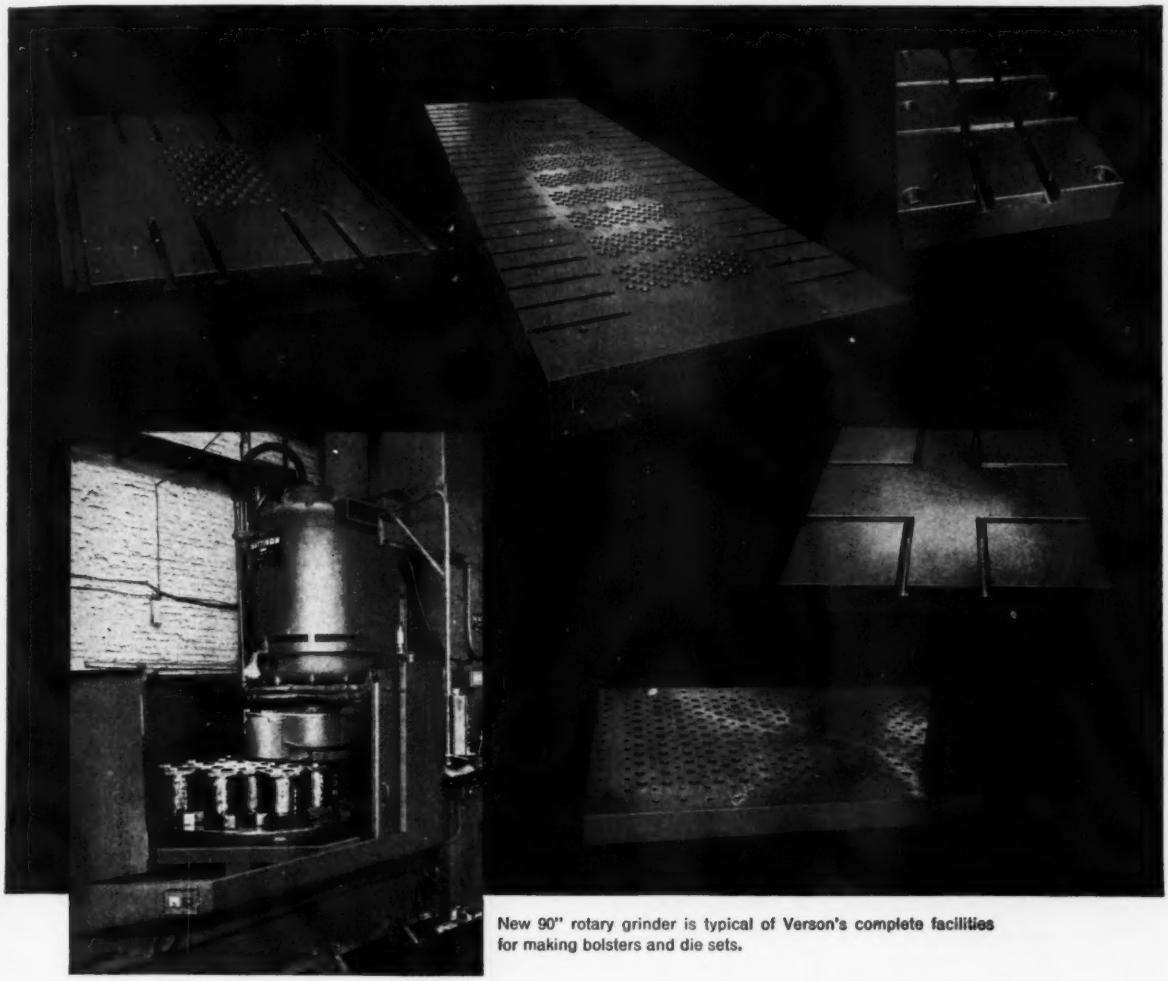

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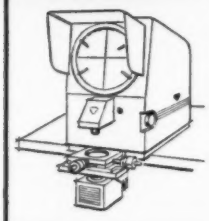
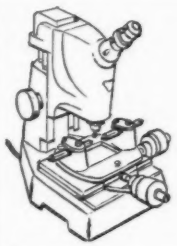
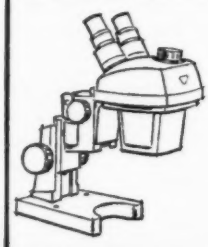
Let's talk about YOUR precision measurement problem!







Do you need fast, accurate measurements to a "tenth" or better? Some contour, an angle? Or odd-shaped small parts that have to meet tight tolerances in *all* dimensions?

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CIRCLE INFORM-A-GRAM KEY NO. 12

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Opportunities In The Sixties

by Elmer W. Cress

Mr. Cress is president of Buchanan Steel Products Corp., Buchanan, Mich. His talk, excerpted here, was presented at the Drop Forging Assn.'s recent meeting in New York.

WILL *YOUR* BUSINESS BE BETTER in 1970 than in 1960? The answer lies in the question, will the management of your business be stronger in 1970?

Will you have done everything possible to assure that the answer to this question is yes? A satisfactory rate of growth, satisfactory levels of profits, satisfactory general promise for the future — these together constitute par for success in the sixties.

Every employee of every company has an important stake in achieving this "par." Charles R. Sligh Jr., executive vice president of the National Assn. of Manufacturers, put it very well when he said: "Pity the employees of the company that can't stand up in the race. Their jobs are shaky, getting ahead is limited and their chances of earning more money almost hopeless. Profitable operation of the company he works for is the greatest security an employee can have."

Some wise philosopher said, "Success is a journey, not a destination." It is my sincere desire that by working together we have a safe and happy 10-year journey.

The handwriting is on the wall: 1) Next year every metalworking company will compete against at least one product that does not exist today. 2) As much as 80% of industry's growth in the next

. . . Continued on page 14

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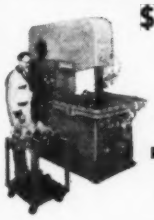
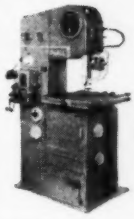


Fixturable table power feed uses HSS saw bands

4 CONTOUR MACHINE — 51¢



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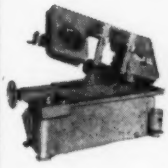
5 POWER SAW — 41¢

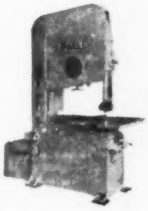


For hand-operated cut-off work

6 LAPPING MACHINE — 71¢

Ultraprecision dimension finishing

7 ZEPHYR MACHINE — 89¢



High-speed and friction sawing

8 POWER SAW — $1.44

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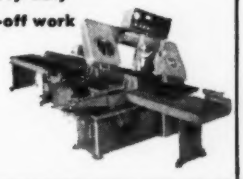
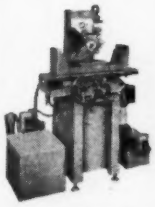
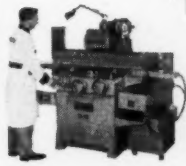


9 SURFACE GRINDER — 33¢



Precision manual operation

10 SURFACE GRINDER — $1.28



Production precision automatic operation

11 BAND MILL — $5.13

For slabbing shanking refacing

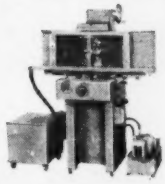
12 ANGLE POWER SAW — $1.65

Automatic angular cuts up to 45°

13 I/D MICRO-SLICER — $1.80

Automatic precision slicing semiconductors

14 MICROTOM-ATIC* — 61¢



Manual precision slicing and dicing

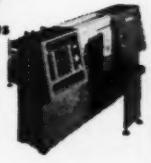
15 PAN-ARM* SAW — $7.76

Contour cutting huge parts

*Reg. T.M.—The DoALL Company

16 CONTINENTAL PRODUCTION SAW — $2.40

For continuous heavy-duty cut-off work T. carbide saw bands



MAIL THIS COUPON TODAY!

THE DoALL COMPANY Des Plaines, Ill. B-65

We want more information on the machines checked HERE: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 13

A NEW "COMPACT" HITS THE MACHINE TOOL FIELD...

THE NEW HARIG 612 SURFACE GRINDER

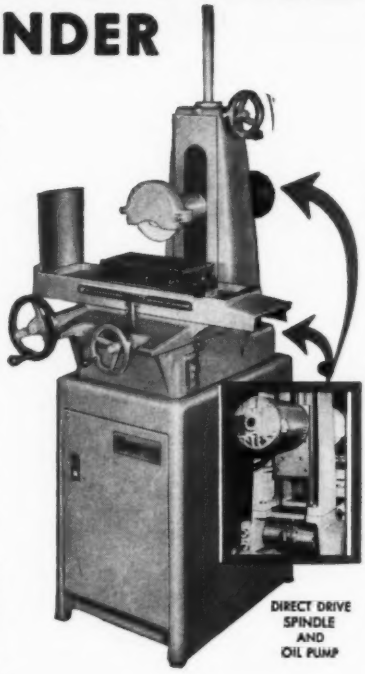
with

* **Automatic forced lubrication** goes into operation as soon as machine is started — triples life of the ways and preserves original accuracy.
* **Direct drive spindle** increases power . . . reduces vibration . . . no V-belts to replace.
* **Your choice of right or left hand longitudinal feed**

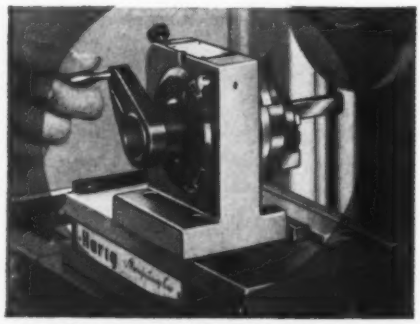
All Standard Equipment

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.

GET ALL THE FACTS . . .
Write for brochure on the Harig 612 Surface Grinder

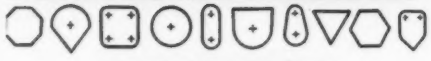


DIRECT DRIVE SPINDLE AND OIL PUMP



. . . AND HARIG'S NEW IMPROVED GRIND-ALL FIXTURE

Easily grinds irregular shaped perforators concentric with shank within ± .0001 accuracy. Also can be used for milling, boring, inspection, and radius dressing. New features include v-block adjusting screw and sine arrangement to obtain any desired angle.



WRITE FOR THE NEW GRIND-ALL BROCHURE

WHATEVER YOUR TOOLING REQUIREMENTS . . . HARIG IS READY TO SERVE YOU!

ENGINEERING — PROGRESSIVE DIES
DESIGNING — MOLDING DIES
CARBIDE DIES — JIGS, FIXTURES
LAMINATION DIES — & GAUGES
SPECIAL MACHINING

Harig Manufacturing Corp

5761 W. Howard St. • Chicago 48, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 14

. . . Month's Talk from page 12

three years will come from products not now being produced. 3) Right now, our competitors are working on products they'll introduce in any of the next 10 years.

About 20 years ago, Paavo Nurmi, the great Finnish distance runner, talking to a group of sportswriters, made a profound statement. He said: "The four-minute mile will be run just as soon as somebody believes it is possible. The barrier is in the mind, not the legs." It's like that with regard to the ground we must cover.

Not necessarily in their order of importance, I give you what I think are the main researching areas that need improvement. There are seven of them.

Cost Reduction

No expense is too small to be worth saving. We must declare a full scale war on costs — and now! A qualified person should be appointed in every plant to help increase pcs/manhour, lower die costs, lower indirect labor costs, decrease maintenance and shave other overhead.

I also recommend that you give most serious consideration to the engagement of professional consultants to help set engineered standards and to co-ordinate the war on costs.

Better Use of Management Aids

Your position in industry at any given moment is not the important thing, but the trend is. When viewed over the months or years, it may tell a very significant story.

If industry's sales are holding up while yours are declining, take a look at your marketing machinery. On the other hand, if your sales are running ahead of your percentage share of industry's story, that's good news — as long as your increase in sales volume has been profitable.

Unless you are charting your position, you may not be conscious that you are drifting. The place you go by drifting is usually downstream.

Research and Development

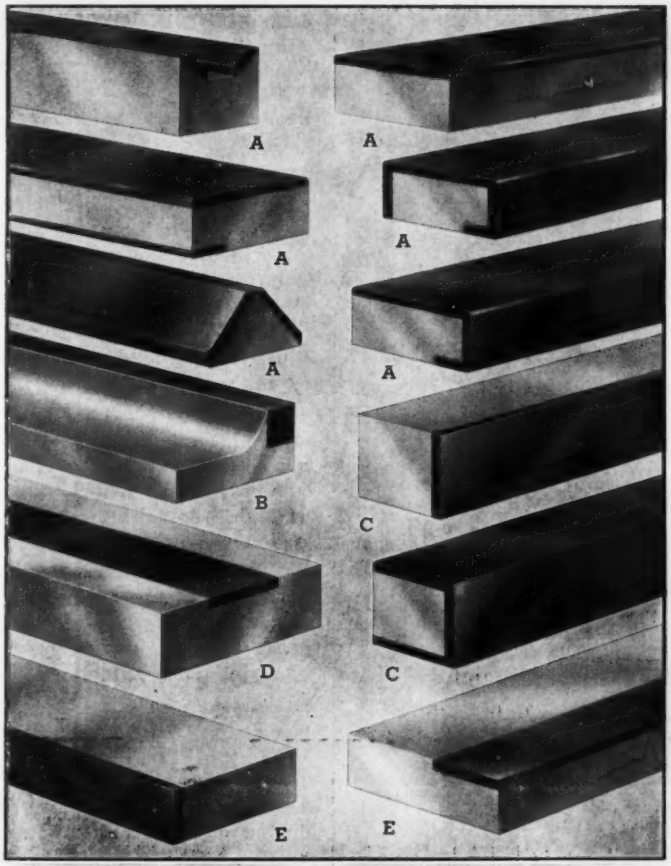
Improving a forging can bring about cost reduction in various

. . . Continued on page 16

O-KNI-CO METALWORKING news
PRODUCTION FACTS THAT INCREASE YOUR PROFITS
PUBLISHED BY THE OHIO KNIFE CO., CINCINNATI, OHIO

NEW READY MADE STANDARD HARDENED SHAPES SAVING MONEY FOR HUNDREDS OF COMPANIES

USED FOR DIES, DIE SECTIONS, FLANGE SECTIONS, WAYS, GIBS, RAILS, WEAR PLATES. CARRIED IN STOCK BY OHIO KNIFE CO., CINTI., OHIO.



A—Hardened Ways and Slides B—Composite Die Sections
C—Heel Block D—Center Clad E—Flange Slide

Over 12 standard cross sections in over 80 sizes now available.

The multiple use of these sections by machine tool builders, die makers, etc., has increased tremendously. Great savings are achieved by being able to order from stock and in lengths up to 120". They are delivered to the customer with cutting, forming or wear surface already machined, hardened and ground. The soft steel backing, to which specially hardened tool steel is clad, can be drilled quickly for dowel and screw holes. The special O-Kni-Co hardening process (65-66) Rockwell to the full depth of tool steel along the entire length of the section develops tremendous wear resistance. They are precision made to the closest tolerances. Also available are clad aluminum bronze wear plates (¼" thick aluminum bronze clad to a tough, easily machinable steel base.)

FREE technical literature available. Check off—mail coupon today.

THE OHIO KNIFE CO., Dept. 100LL
Cincinnati 23, Ohio

Gentlemen: Please send me free copy of:

☐ BULLETIN-A describing 12 standard cross sections in over 80 sizes

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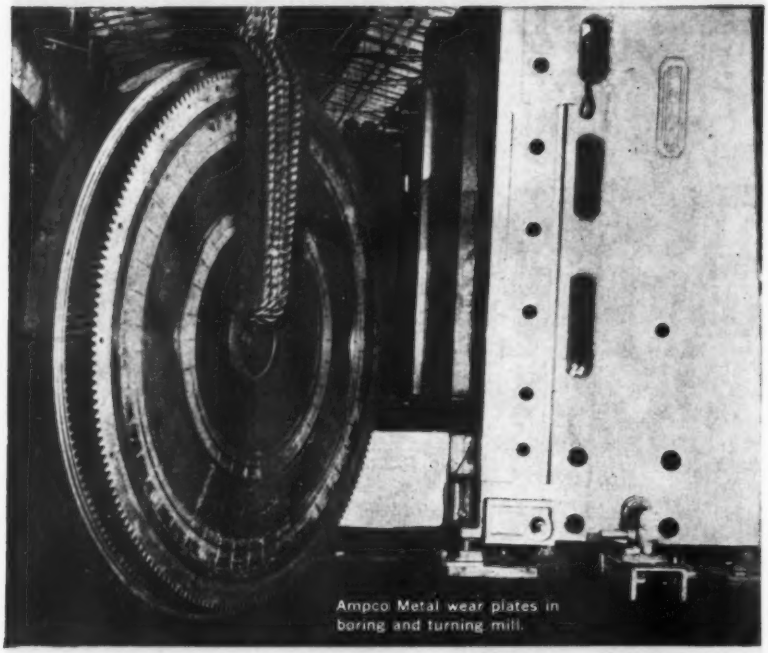
AMPCO®

EXTEND SERVICE LIFE

Use AMPCO 8 for ways, slides, gibs, guides, wear plates and strips



Ampco Metal wear plates in boring and turning mill.

AMPCO 8 SHEET AND PLATE

combats metal-to-metal wear

The special structure of Ampco 8 — further enhanced by special rolling and cross rolling procedures — withstands high working pressures and shock, resists abrasion, erosion, corrosion, and cavitation-pitting.

Where extremely severe wear (under high compressive loads) and abrasion is encountered, Ampco 18 and 21 stock extruded rectangles are available.

Your stock distributor can recommend the grade and form for your application and deliver from stock to your requirements. Write for his name — and Bulletin G-50. 0-83

AMPCO METAL

AMPCO METAL, INC.
Dept. 54A, Milwaukee 1, Wis.
West Coast Div.: Huntington Park, Calif.
Southwest Div.: Garland (Dallas County), Texas

CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk from page 14

related areas, less die wear and less machining, to mention two.

The following quote is from an interesting article on cost reduction: "Last year cost reduction through redesign accounted for 34% of net profit of a major concern. Nearly as many dollars were added to profits from other cost-cutting routines like overhead controls, decentralization of facilities, rework of incentive plans, smart purchasing and automation. And not all of the savings found their way into earnings. Some were passed along to the customer in lower prices and better quality."

According to William E. Hill, managing partner of the New York management consulting firm William E. Hill and Co., "Half the research and development done in this country has been since 1955. And still a greater research effort is forecast for the 1960's, with expenditures projected to reach an estimated level of 25 to 30 billion dollars by 1970. The present rate is only 12 billion.

Stronger Industrial Relations Policies

Without a doubt, making any comparisons you wish, the cost of labor has reached a perilous high. No one of us wants to deny to labor the fruits of its toil, but there is no resiliency in the market to absorb the higher prices we are required to pay. So perhaps it is time that we do some researching in this area.

Denying no one his right to do as he pleases, what can we accomplish together that we cannot accomplish acting alone to curb the trend of ever-spiraling wage costs?

Marketing

"The view that an industry is a customer-satisfying process and not a goods-producing process is vital for businessmen to understand," said Theodore Levitt writing in the July-August issue of Harvard Business Review.

It has been correctly said that we are a production-oriented industry and not market oriented, yet we know that our companies began with our customers and their needs. In this connection, we should draw a distinction between

. . . Continued on page 18

UNIVERSAL R & R DEBURRING TOOLS

with spring-loaded retractable blade give precision-cut edge or chamfer at high speed without chatter

Adjustable spring tension allows continuous contact with work-piece to eliminate chatter at high operating speeds. Free-floating blade permits self-alignment and uniform stock removal. Made in a full range of sizes to 1½" diameter.

Blades of the Universal R & R Deburring Tool are made of high speed steel, precision hardened and ground to close tolerances for interchangeability. May be used as horizontal deburrer in portable electric drill or in standard drill press.

For full information, write to Universal Engineering Company.

Write today for complete catalog of Universal Engineering products.

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UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 17

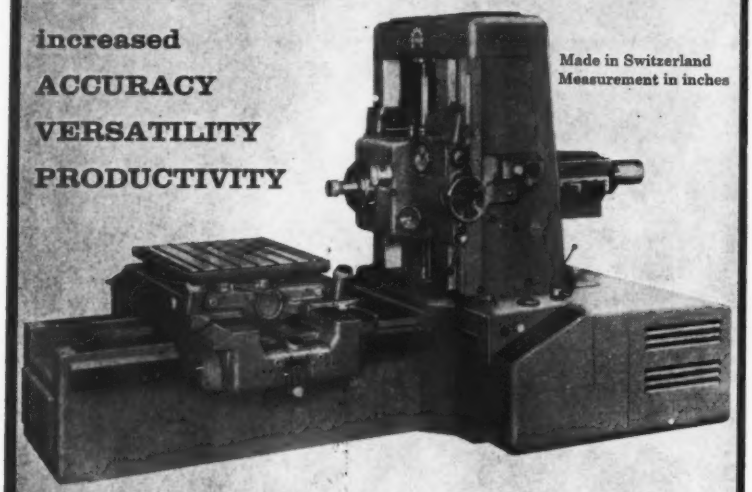
CUT ACCUMULATED ERRORS to a minimum

with the

DIXI 75 horizontal optical jig borer

increased
ACCURACY
VERSATILITY
PRODUCTIVITY

Made in Switzerland
Measurement in inches



- Automatic positioning can be changed instantly to manual operation
- Projected optical setting—direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff. and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

MBI

M. B. I. EXPORT & IMPORT LTD.
A DIVISION OF MACHINERY BUILDERS, INC.
475 Grand Concourse, Bronx 51, N. Y.
Swiss Accuracy plus U. S. Know-how

CIRCLE INFORM-A-GRAM KEY NO. 18

. . . Month's Talk from page 16

selling and marketing. Selling concerns itself with the techniques of getting people to exchange cash for our products. "And it does not, as marketing invariably does, view the entire business process as consisting of an effort to discover, create, arouse, and satisfy customer needs," says Mr. Levitt.

Integration

The question is one of expanding sales by adding to our ability to perform a greater variety of operations. We should look forward to doing more coining, more machining, more heat treating and more plating. The point is, there is a lot of business to be had from present customers — if we are able to do it — and if we go after it.

Diversification

In the interest of leaving no stone unturned, I recommend this time - honored and time - tested means of protecting your capital. Diversification, or any legitimate way in which we can employ capital to further the purpose of diversification should be explored.

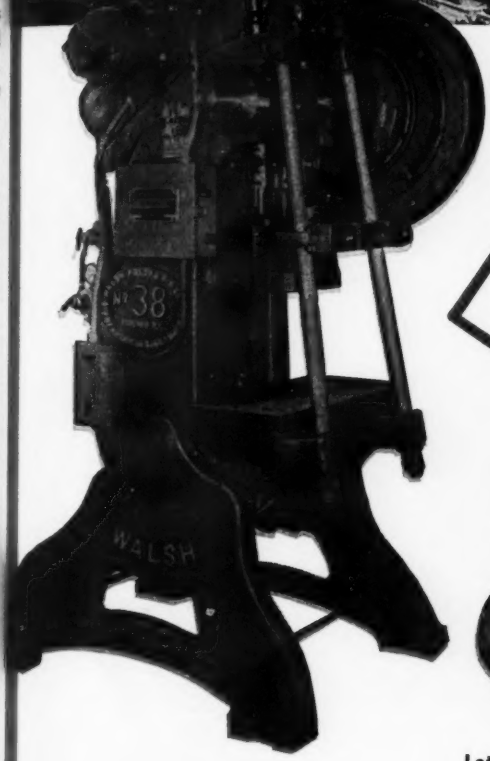
Opportunities for success in the sixties involve an enormous amount of work. Another quote from Mr. Hill: "The capacity of your company to prosper may well depend on your creative marketing and your technology. A five to 10 year program that anticipates product and market opportunities and threats before they develop can provide the imaginative plans and action for competent leadership in domestic and foreign markets. When projected in relation to a company's growth program, many a current advertising program and marketing budget will be found inadequate."

The road to Success in the Sixties is clear. Navigating it requires that we succeed in joint efforts. Success lies in bringing our best brains to bear on common problems.

Without neglecting longer term problems, what can we do right now? Let me suggest a temporary course of action. Hold a meeting and decide how much business you are going to go for in the year ahead. Then, figure out how to create that amount of business — at a profit. end

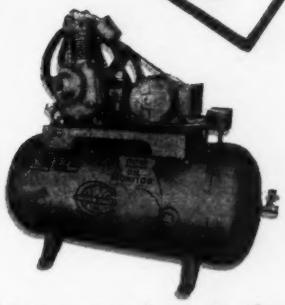
From the HEARTLAND of America

From Chicago—the Heartland of America—these leaders in their respective fields of production and precision can help you with your manufacturing problems.



WALSH 38-Ton Air-Clutch High Production O.B.I. Press

All presses "run-in" with Molykote at the factory.



CHAMPION'S

Two-Stage Automatic Horizontal Compressor OEH 38-60 with Exclusive Oil Monitor (low oil level safety control).

INSPECTION SERVICE FOR INDUSTRY

SEAL OF INSPECTION
PRECISION
THE MIDWEST GAGE LABORATORY
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Let our experience in the fields of production and precision prove beneficial to you and your product. Write or phone any of these firms for complete information about their important new products and services. In addition, all offer free engineering consultation services. There's no obligation on your part, of course.

Industrial Divisions of AMERICAN GAGE and MACHINE COMPANY

CHAMPION PNEUMATIC MACHINERY COMPANY • 826 North Pleasant Street • Princeton, Illinois • Phone: 3-1215—Air Compressors Since 1919

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Precision Gages
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Punch Presses Since 1907

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2500 West Washington Boulevard
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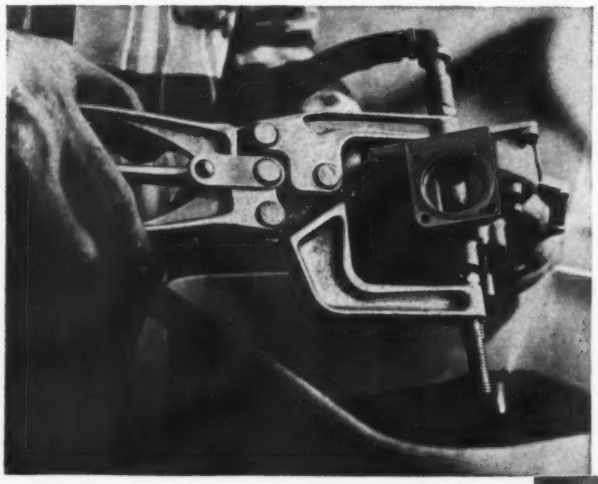
Inspection Service for Industry

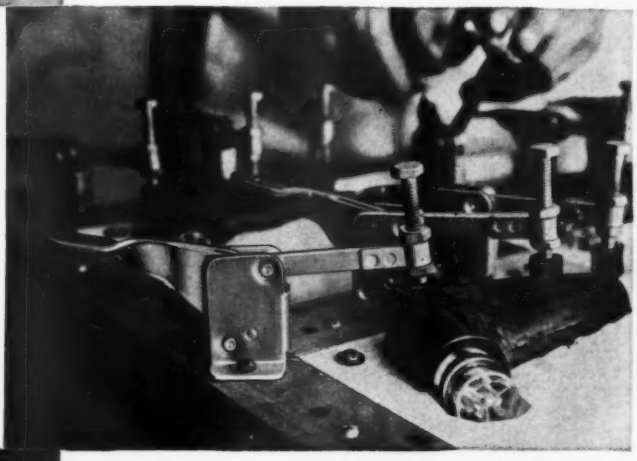
CIRCLE INFORM-A-GRAM KEY NO. 12

Look what clamps are doing!



Practical uses of Wespo Toggle Clamps and Pliers that may suggest ways you can save

Toggle plier serves as low cost fixture for testing castings The air line is connected through one jaw of a Wespo Model 522 Toggle Plier. The plier is then clamped onto the casting and air applied by a foot control. Immersing the casting into a tank quickly spots any defects. Patented "Quick trigger" feature of the Model 522 instantly releases the casting; speeds testing. Rugged, lightweight Wespo toggle pliers are available in various jaw capacities and sizes.



Holding these glued parts together while drying is a simple task with Wespo Horizontal Bar-Type Toggle Clamps. Neoprene-capped spindles prevent damage to plastic surfaces, yet securely hold the parts during the drying operations. Wespo toggle clamps are available in more than 80 types and sizes. So, the next time you think clamps, think Wespo!

Simple, low cost "parking brake" for this track-operated frame is provided by a Wespo Push-Pull Clamp equipped with a neoprene-capped spindle. "Brake" is quickly applied or released by a simple flick of the wrist. Wespo Push-Pull Clamps are available in various sizes and holding pressures and are ordinarily used on holding fixtures where push or pull clamping is required.

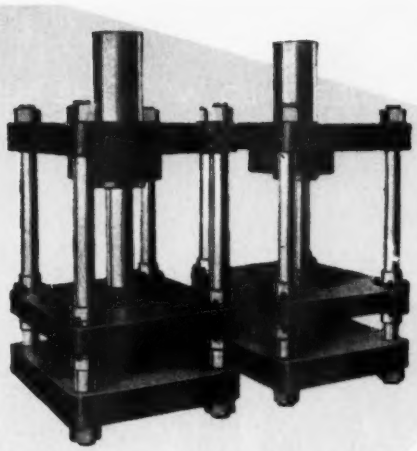
FREE CLAMP CATALOG!
Ask your Wespo distributor for your free copy of this 16-page Wespo catalog. It will help you quickly select the right clamp for every clamping job.

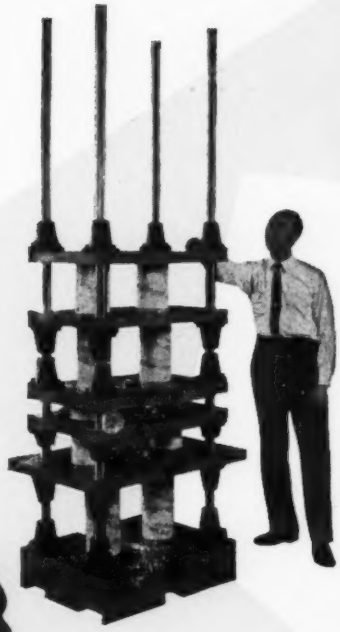
WESPO

DIVISION OF VLIER ENGINEERING CORPORATION
26935 W. Seven Mile Rd., Detroit 19, Michigan
Formerly West Point Manufacturing Company

CIRCLE INFORM-A-GRAM KEY NO. 20

Do you have a special die set problem?

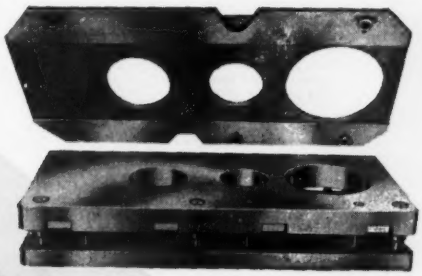




Producto can help you solve it. Special die sets can be large or small—weigh tons or a few pounds; they may be of steel plate, or castings; two-plate or multi-plate.

Often, they can be ordered directly from Producto's catalog. We regularly machine our "catalog specials" to meet your individual requirements. And, when you need a radically different, one-of-a-kind die set—call us. Our 35 years of die set manufacturing experience are yours for the asking.

Just call your nearby Producto distributor, or our manufacturing plants in Bridgeport or Detroit.



DIE SET DIVISION
THE PRODUCTO MACHINE COMPANY
945 Housatonic Avenue, Bridgeport 1, Connecticut

PRODUCTO

DIE SETS & ACCESSORIES • PUNCHES & DIES • TOOLROOM EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 21

PRODUCTION MACHINERY
GREENLEE

- Special Purpose Machines
- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

COOPERATIVE TEAMWORK MAKES THE DIFFERENCE

Through every phase of the construction of a Greenlee transfer machine, Greenlee engineers maintain a close contact with you, the customer. They are strong on the buyer's viewpoint . . . know what cost-conscious management wants. They stay on the job from the time of initial planning until your machine is operating at full efficiency. This last phase—the proving out period—is especially important. Greenlee men are extremely helpful in bringing your machine up to full production . . . training your operators to keep it producing profitably. Call Greenlee. Let them show you how cooperative teamwork can benefit you.

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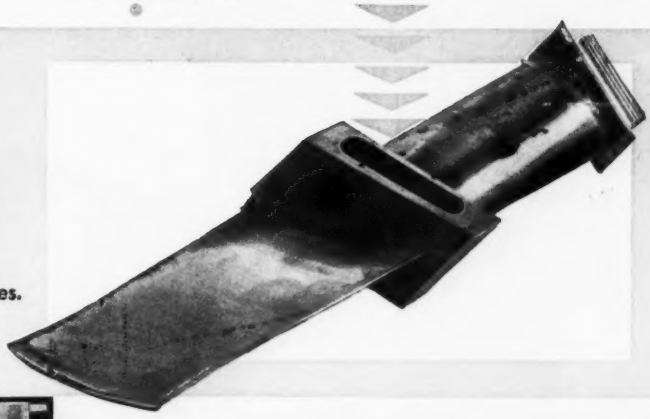
ANOCUT HCS-59 ELECTROLYTIC CAVITY SINKER

REMOVAL RATES TO 60 CUBIC INCHES PER HOUR AVAILABLE IN STANDARD EQUIPMENT. HIGHER CAPACITIES ON APPLICATION.

A LITTLE SQUIRT OF BRINE CUTS CAVITY IN TOUGH SUPER ALLOY 4 TIMES FASTER THAN... CONVENTIONAL MACHINING!

IN PRODUCTION...

Cavities in this jet-engine "blucket" made of A-286 super alloy are produced two at a time in 8 minutes. Previous time 32 minutes.



ALSO . . . ELECTROLYTIC GRINDING. HAMMOND MACHINERY BUILDERS MODEL SCE-6 CARBIDE TOOL GRINDER MADE EXPRESSLY FOR USE WITH ANOCUT POWER SUPPLY UNIT. HUNDREDS IN USE.

- NO CUTTERS!
- NO ARCS!
- NO METAL DAMAGE!
- NO SPARKS!
- NO HEAT!
- NO ELECTRODE WEAR!

PHONE. .WIRE. .WRITE FOR FURTHER INFORMATION AND LITERATURE.

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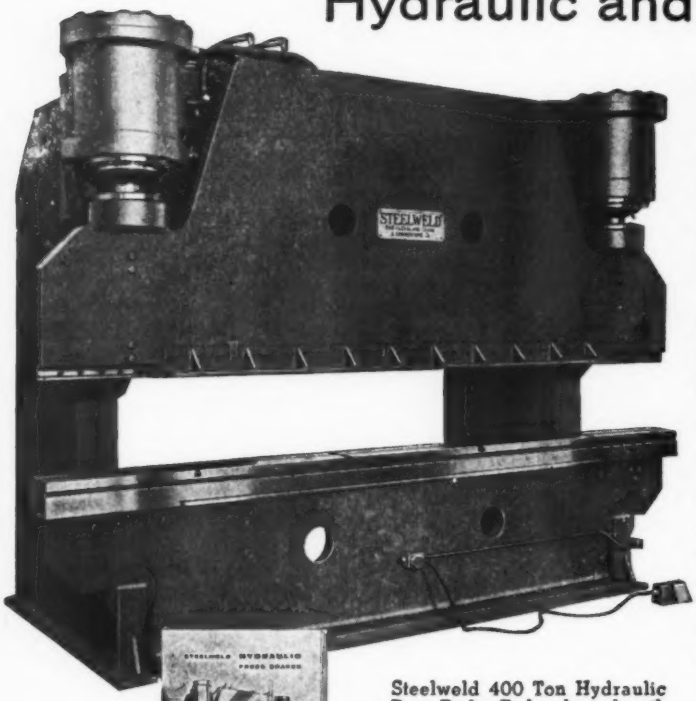
CIRCLE INFORM-A-GRAM KEY NO. 23

STEELWELD PRESS BRAKES

Hydraulic and Mechanical



WHATEVER your requirements, there is a Steelweld Press Brake —hydraulic or mechanical—to best serve your needs. Available in all sizes to 2000 tons. For plate thicknesses to 2". For lengths to 30'-0".

Each type of machine, mechanical or hydraulic, has its particular advantages. The work to be performed is the determining factor for most satisfactory machine selection.

As a manufacturer of both types of press brakes, we are in a position to offer you either one without partiality. Therefore, we urge you to get the complete story, the Steelweld story, when considering the purchase of a new brake. Ask for free catalogs.

Steelweld 400 Ton Hydraulic Press Brake. Bed and ram length 14'-0".

Steelweld 320 Ton Mechanical Press Brake. Bed and ram length 12'-2".

Hydraulic Press Brakes
Catalog No. 2024

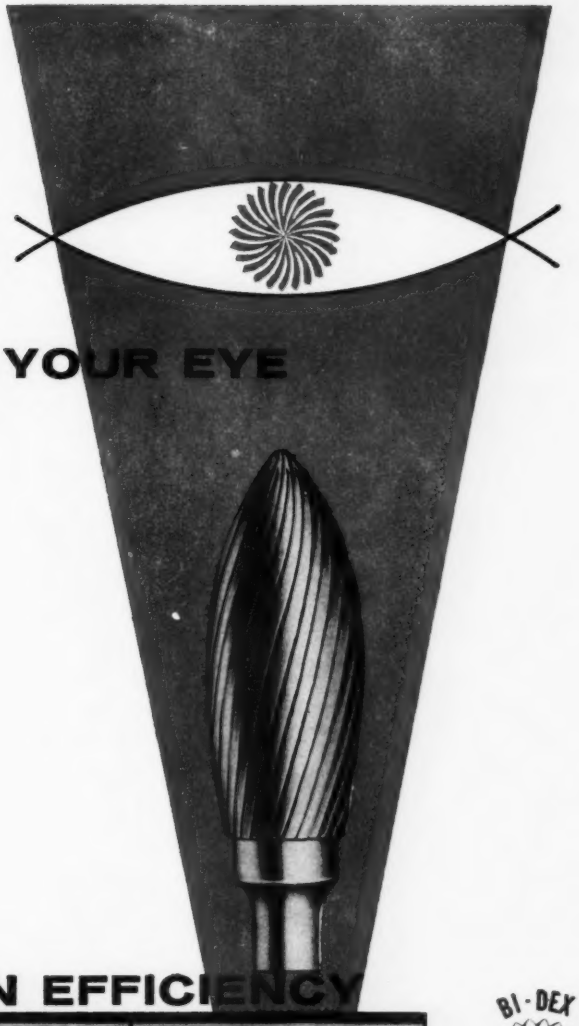
Mechanical Press Brakes
Catalog No. 2023

STEELWELD
Mechanical and Hydraulic
PRESS BRAKES

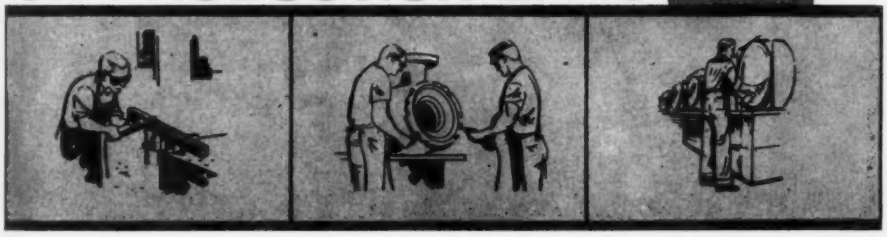
Steelweld Machinery includes: Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

Steelweld Machinery Division, The Cleveland Crane & Engineering Co. • 8775 East 281st Street, • Wickliffe, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 24



BI-DEX* KEEPS YOUR EYE ON PRODUCTION EFFICIENCY



BI-DEX

FACET TOOTH

BI-DEX* Tungsten Carbide rotary files by Grobet File Company of America, Inc. — a revolutionary new design that eliminates the "dead area" at the head of the burr, reduces chatter and build-up of chips.

If you want to keep your eye on efficient production also ask for a demonstration of the new **FACET TOOTH*** file, another momentous recent innovation in file construction, designed for greater cutting speed, longer life and greater efficiency.

BI-DEX* and **FACET TOOTH*** T.C. rotary files are available in a number of shapes and sizes.

GROBET-U.S.A.

Order from your distributor or write directly to

*Trade Mark

Grobet File Company of America, Inc.

Carlstadt, New Jersey **Chicago: 311 No. Desplaines St.**

CIRCLE INFORM-A-GRAM KEY NO. 25

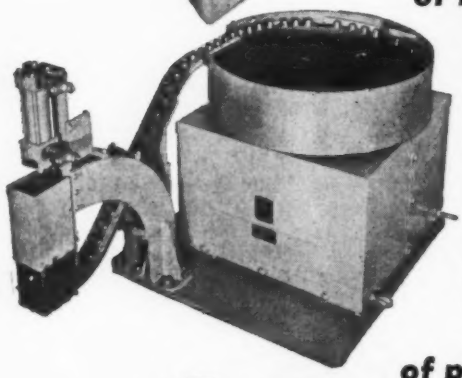
THE CARE AND FEEDING

of parts discharged at high or low heights

DPS ELEVATING FEEDERS elevate, orient and feed parts of almost any size, shape and material to other machinery for processing and assembly. High capacity storage bins are designed to assure a steady flow of parts to elevating mechanism regardless of load level.

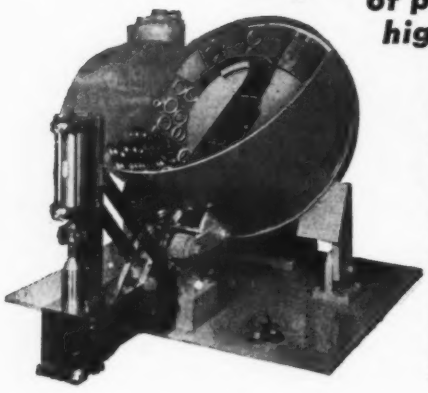
Orientation of parts is accomplished at discharge point of elevator — simplifying external track construction. Feeder can be arranged for right- or left-hand discharge. Return chutes are cushioned.

New Bulletin 2812 has full data on DPS elevating feeders. Write for your copy today.



of fragile or finished parts

DPS VIBRATORY FEEDERS are bowl type units that gently handle parts too light or fragile to be handled in rotary type feeders. Through a simple electromagnetic drive, a vibrating action is transmitted to the bowl causing the parts to move up a circular, inclined track. The oriented parts then enter feed tube or discharge track to machining or assembly areas.



of parts for high-production assembly

DPS ROTARY FEEDERS employ radially slotted or grooved rotating collector rings. Efficient orienting and feeding of parts is achieved through proper design and engineering of baffle plate, selector guard, feed track, and escapement mechanism. Three different designs are available to meet holding, orienting and feeding requirements. Safety clutch prevents damage to motor or gears in the event of parts jamming.

Detroit Power Screwdriver Company offers industry's most complete line of selective feeders . . . ranging in holding area from 80 cu. in. to 20 cu. ft. For complete details, call your DPS representative or write direct. *Ask for free catalogs!* 15,303

DETROIT POWER SCREWDRIVER COMPANY

2827 W. Fort St. • Detroit 16, Michigan

A Subsidiary of Link-Belt Company

CIRCLE INFORM-A-GRAM KEY NO. 26

Trade-In Plan Announced

"We have long recognized the need for an active replacement program for obsolete high production machine tools," said Wallace B. Bainton recently in announcing Brown & Sharpe Mfg. Co.'s new trade-in system for automatic screw machines.

The vice-president and general manager of B & S's machine tool division said that the trade-in idea was launched by a desire to help users of this machinery streamline operations. Recent surveys show that almost 50% of the single spindle automatic screw machines now in use are 10 to 20 yrs old.

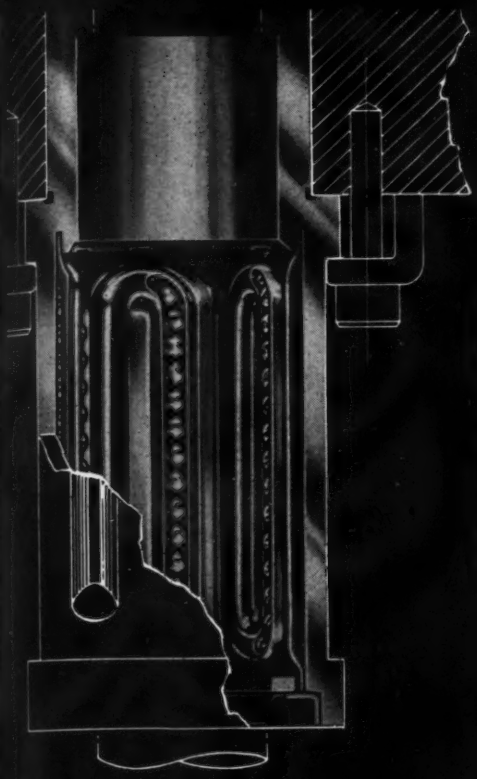
Under the new plan, the Providence, R.I., firm will allow $500 toward the purchase of a new automatic screw machine for each old B & S model traded in, on the basis of one old for one new machine. The old numbers will be scrapped in Providence.

Unique Meeting

Nearly 100 members of the Rockford, Ill., chapter of American Society of Tool and Manufacturing Engineers, took a 100 mile bus ride recently for their regular meeting.

The site of the meeting was the Hall of Progress at The DoALL Company, Des Plaines, Ill. — a unique auditorium combining an unusual museum that delineates the most important events of the Industrial Revolution and the company's busy customer research laboratory. Members met under a three-stories-high symbolic sunburst, called "The Dawn of This Age." It depicts 157 important discoveries, inventions and new concepts of the Industrial Revolution responsible for man's present age of abundance.

CIRCLE INFORM-A-GRAM KEY NO. 27



THOMSON INTERCHANGEABLE die-set BALL BUSHINGS®

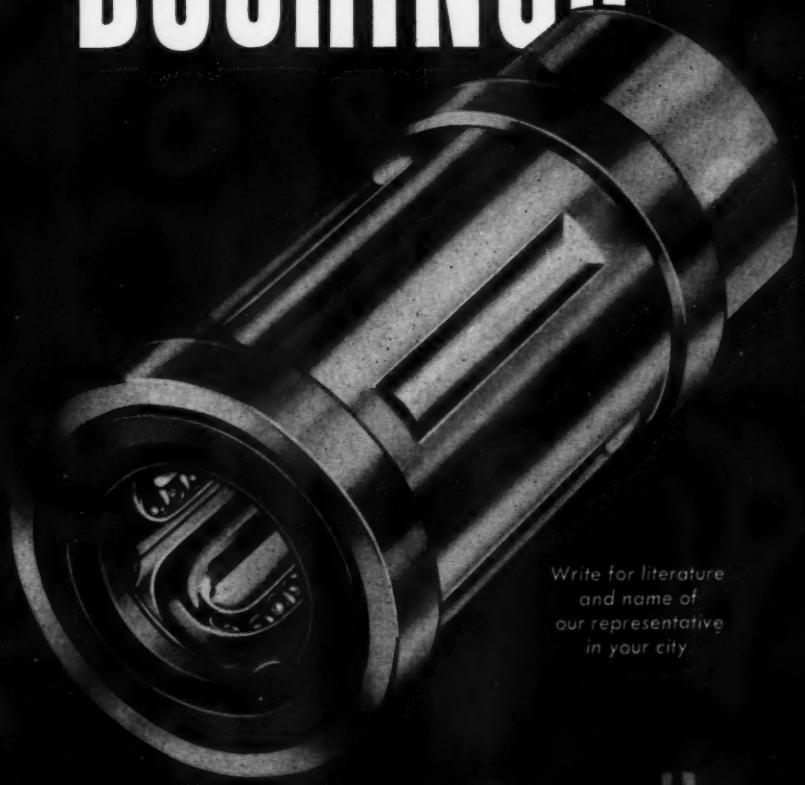
NEW!

O ANTI-FRICTION

th a simple bushing replacement

nd (1) Improve performance of your *present* dies

nd (2) Reduce tool room costs



Write for literature and name of our representative in your city.

in the PRESS ROOM

Ball Bushings allow closer fits and maintain gnment which increases die life and permits ger uninterrupted runs. Fewer sharpenings and tained parts accuracy also result. Periodic lubtion is eliminated and higher speeds are posle. Unlimited travel permits die to be used in y press regardless of stroke. Costly smash-ups e to seizure are eliminated.

in the TOOL ROOM

No cocking and binding...hence the punch holder "floats" on and off! No time consuming die jacking! Free-rolling *ball* bearings enable the toolmaker to actually "feel in" the fit of mating parts. This saves more time and makes better dies.

THOMSON INDUSTRIES, Inc.
Dept. D-5, MANHASSET, NEW YORK

Makers of 60 Case hardened & ground shafting and NYLINED Bearings...Sleeve Bearings of DuPont NYLON

DEPENDABLE... predictable response to heat treatment every time

Send for Bulletin 102— "Helpful Heat-Treating Hints."

The full uniformity within each bar of Desegatized FM die steel and the consistent uniformity from lot to lot simplifies the heat treatment of your die components. Predictable hardnesses are readily attainable . . . distortion and size change are minimized . . . danger of cracking is lessened!

In free machining FM die steels, full uniformity is achieved through Latrobe's unique Desegatized process of manufacture. This process guarantees an even distribution of carbide particles, free machining alloy sulphides and other alloying elements . . . factors leading to improved machinability, greater toughness and improved wear resistance in addition to the optimum heat-treating characteristics.

Latrobe's 12% chromium FM die steels are available through district steel service centers near you. Grades include: Olympic FM (Type D-2) for long-run applications; GSN FM (Type D-3) non-deforming die steel; Cobalt Chrome FM (Type D-5) for extra resistance to galling and pickup.

Call your Latrobe representative today!

Manufactured by skilled American labor

LATROBE
Metalmasters

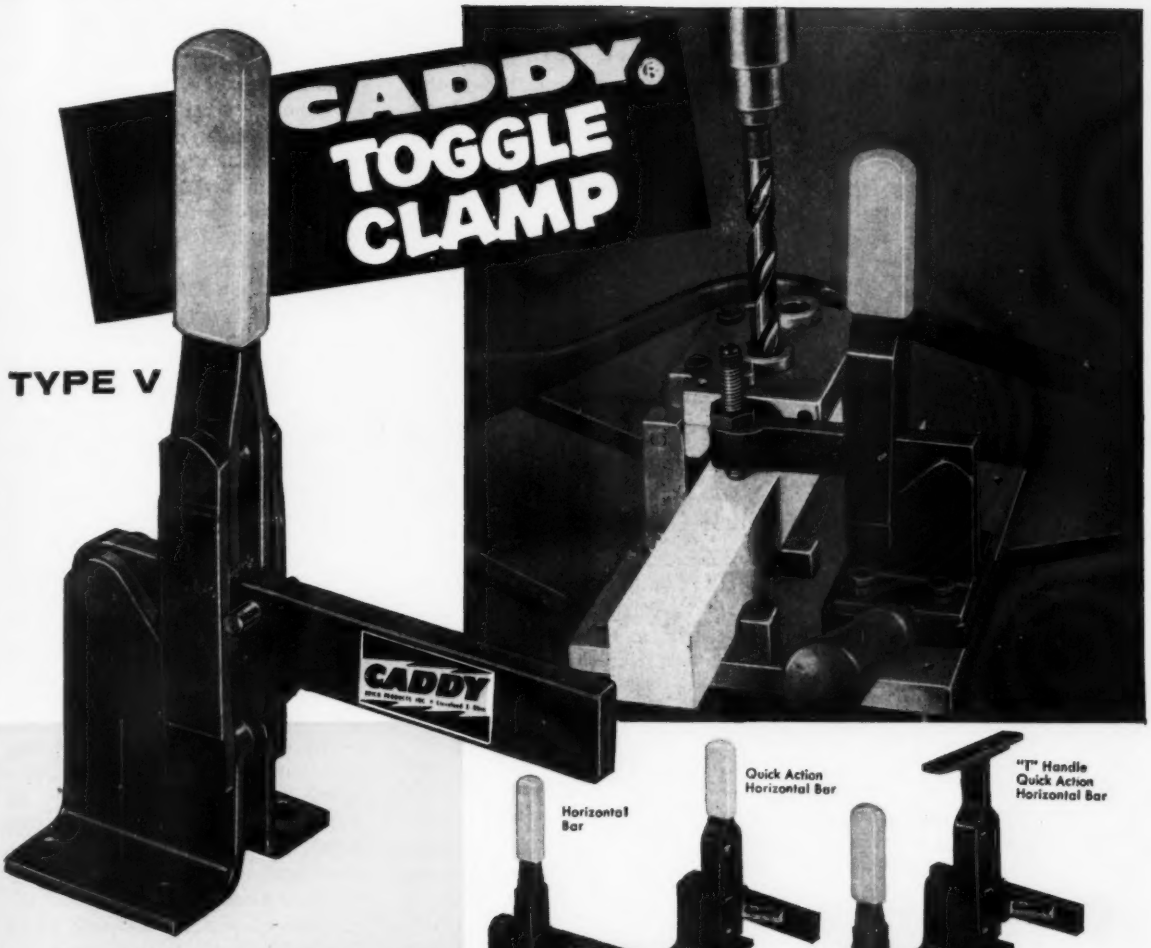
LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

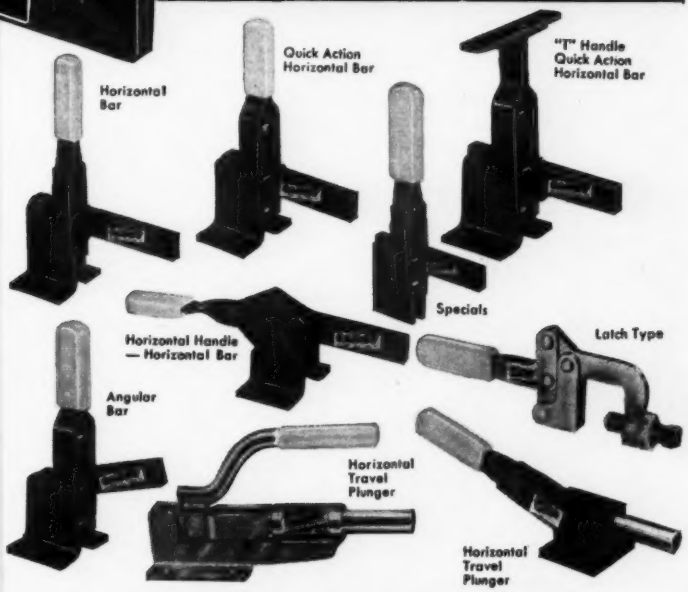
BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

CIRCLE INFORM-A-GRAM KEY NO. 28

CADDY® TOGGLE CLAMP

TYPE V





CADDY Type V Toggle Clamps feature all welded construction. Four sizes are available with clamping pressures from 800 lbs. to 2,000 lbs. Built to outlast any clamp on the market. Clamps have black finish with yellow plastic handles. Bolt retainer is furnished with each clamp.

1. **EXTRA LARGE PIVOT PINS—Up to 3 times more bearing surface than other clamps. In actual test under load, V-3 clamp withstood 250,000 cycles without excessive wear.**
2. **ALL WELDED CONSTRUCTION—Will not come apart even after pins become excessively worn.**
3. **HEAVIER FRAME—Will not spring or bend under maximum load.**
4. **HEAVIER LINKS AND HANDLE—Will withstand extreme abuse. Pipe extension handle may be used without damage to linkage.**
5. **REINFORCED CLAMP BAR—Eliminates weak point where pivot pins pass through bar.**
6. **DOUBLE CLAMPING PRESSURE—Design of linkage provides double the clamping pressure of competitive clamps at the same pressure on the handle.**

CADDY®

Toggle Clamp Div. ERICO PRODUCTS, INC.
2070 E. 61st Place Cleveland 3, Ohio

☐ PLEASE SEND CATALOG
☐ PLEASE HAVE REPRESENTATIVE CALL

NAME_____ TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 29

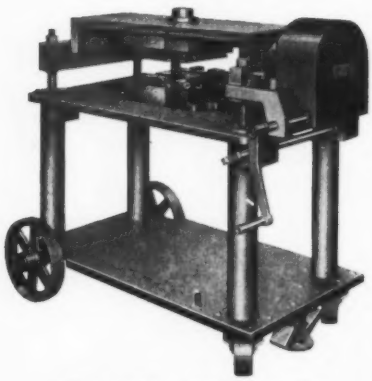
HAMILTON PORTELVATOR

*7 Features** 2967b

1. **Four point load support** — distributes the weight — prevents tipping.
2. **Three table surfaces** — extra space for tools, materials, parts.
3. **Choice** of side location or end location for hand crank studs — to clear overhanging loads.
4. **Wheels under posts** — carries thrust of load through in a straight line to the floor.
5. **Two speed lift arrangement** — provides extra fast operation for light loads or quick return.
6. **Short turn** — six wheel model turns in its own tracks.
7. **Sturdy floor brake** — (two on the six wheel models) prevents unwanted movement.

* . . . and these are only the most obvious features. For complete details you must get a copy of our FREE . . .

Tell-all Literature
Ask for the free Portelvator Bulletin No. P/2967.



DIE-PART® PORTELVATOR

Remember also this sturdy, portable device for maintenance, fitting, and testing of dies. Top plate raises and lowers to fit and separate punch and die — rotates 360° for convenience in making die corrections.

For complete information about the
DIE-PART® PORTELVATOR
Ask for the free Portelvator Bulletin No. DP/2967.

THE HAMILTON TOOL COMPANY
832 SOUTH NINTH STREET
HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 31

Soviet Automation To Cause Industrial Surge

"Soviet scientists have done work in automation theory that, in some respects, goes beyond anything yet done in the U.S. Literally thousands of scientists and engineers are being mobilized in a determined effort to transform theory into production line knowhow," says Business Week.

"Typical of this mobilization is the rapid buildup of special automation application institutes. Four are already in existence, of which the two-year-old institute at Kiev with its 2,000 engineers is the largest and most ambitious." This institute has more than 40 laboratories investigating different areas of automation application.

A look at what the Kiev institute is doing may be enlightening. Standard instrument panels have been designed for control of open hearth furnaces. The panel includes a simple analog computer that calculates the heat input to the furnace, and another that determines the heat absorption and efficiency so that optimal heat conditions may be set up.

In the electric power distribution field, the institute is following on the heels of U.S. practice in installation of a transistorized analog computer to link 13 Soviet power stations in a single grid, with the computer providing distribution of power supply at minimum cost.

Other projects include blast furnace investigations on model furnaces, automatic startup of boiler and steam turbines, machine tool control and automatic flame-cutting equipment for profiling ships' plates.

All this may have far-reaching impact on American businessmen: The Russians are making a mammoth effort to change the face of Soviet industry through automation; the extent to which they succeed will be a major factor in their struggle to surpass the U.S. as the world's foremost industrial power.

To meet the goal of an 80% increase in over-all industrial output, Russia must greatly increase its productivity per worker — now less than half the U.S. standard. By mechanization and automation, the Soviets expect to achieve three quarters of this goal from higher productivity.

All in all, the Seven-Year Plan calls for installation of 1,300 automatic lines by 1965, and a start on automation of entire factories, from unloading of components or raw materials to packaging the finished product.

Chances are the Soviets won't reach this goal, but Western experts note that only 70% achievement will be formidable results.

Rotary Table Is Accurate

Accuracy in inspection, grinding and lapping operations where concentricity, squareness and parallelism are vital, has been heightened with the introduction of a new rotary table.

A heavy steel base, a matched set of steel balls and a revolving top plate with tapped mounting holes are the major components of the AA Gage Co.'s Ultraron table. The firm claims it features runout and parallelism accuracy of 0.000005".

Matching precision races are ground in the base and the top plate. The balls which support the top plate are identical in diameter, and round to within 2 to 3 millionths. They're equally spaced in the lower race, held in place by a special retainer. A bronze center bushing secures the assembly, and a recessed cover plate seals the interior against contamination.

The 17" dia table is 4½" high, weighs 300 lbs, and can support a 1000-lb load.

2967o

HAMILTON PORTELVATOR®

THE HANDY HAMILTON PORTABLE ELEVATING TABLE

It's a HAMILTON TOOL *use it with confidence!*

If you think . . . that the various makes of elevating tables are "all-pretty much-alike", that a device so simple allows scant room for *important* points of superiority, then, without fail, you must have a copy of the new Portelvator literature which we offer in the one column ad on the facing page.

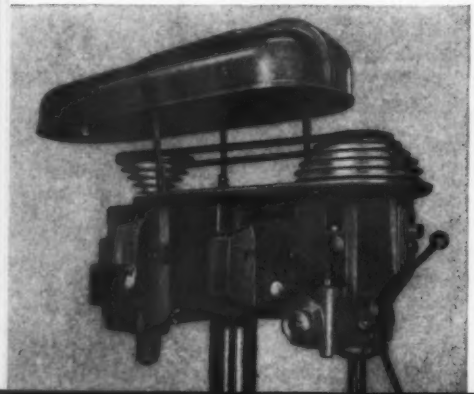
THE HAMILTON TOOL COMPANY

832 SOUTH NINTH STREET HAMILTON, OHIO

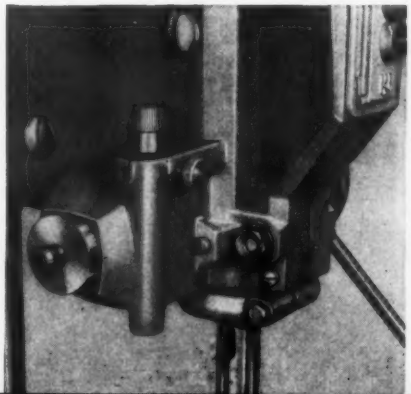
CIRCLE INFORM-A-GRAM KEY NO. 31

ALL NEW Capacity—Equipped with exclusive Rockwell Power Feed (tested through 750,000 drilling cycles) the all new 17″ drill presses handle many production jobs ordinarily done by costly, fixed equipment. In addition, they offer porta that can be utilized to perform extra drilling operations o ited runs or to relieve production line bottlenecks.

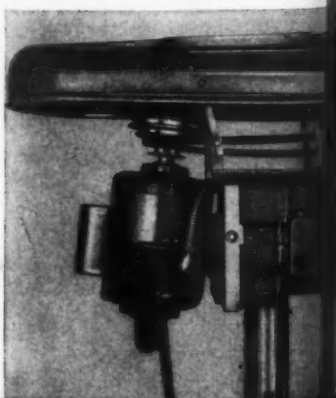
ALL NEW Interference-free Guard—Tilts up and back out of the way giving operator plenty of room to make belt and speed changes quickly, easily. Three specially designed supports and a stop hold steel guard in "up" position, built-in clips automatically lock guard in operating position when closed.



ALL NEW Internal Depth Stop Mechanism—A new concept in depth stops that eliminates bottom-of-stroke quill deflection which causes excessive drill breakage and downtime. Convenient adjustment knob permits fast, one hand operation, locks in position to stop pinion shaft at same depth through repeated cycles.



ALL NEW Pivot-type Motor M—Assures full release of belt tension w changing from one pulley speed to anoth livers longer belt life and eliminates pos of damage to the belt. Maintenance of p running tension on belt at all times pr undue wear on bearings.



You can do more with these

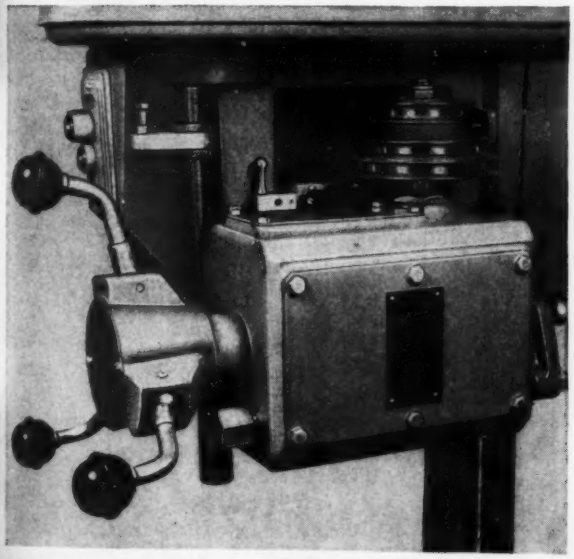
ALL NEW DELTA 17" DRILL PRESSES

Here is a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose the machine best suited to your needs from 76 models in a complete line of 17" drill presses that incorporate the most up-to-date performance features available.

These drill presses are completely new—not merely improved or re-styled—but actually re-designed to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

With the introduction of this all new 17" drill press line, Delta continues to provide the high quality of product that has made it the leading name in drill presses for over 31 years. Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

FREE BROCHURE—Complete specifications and details on the full line of all new 17" drill presses and accessories. Simply write: Rockwell Manufacturing Company, Delta Power Tool Division, 622A N. Lexington Ave., Pittsburgh 8, Pennsylvania.



ALL NEW Rockwell Power Feed—Available as original equipment or as an accessory on every model, this advanced development in mechanical power feeds gives you: a front mounted pilot wheel for one hand operation and "flick of the wrist" control of feeding; infinitely adjustable drill point pressure and a built-in feature that permits remote control. For semi or fully automated operations, power feed can be electrically, hydraulically, pneumatically or mechanically interlocked with other machines.

CHOOSE FROM 76 MODELS

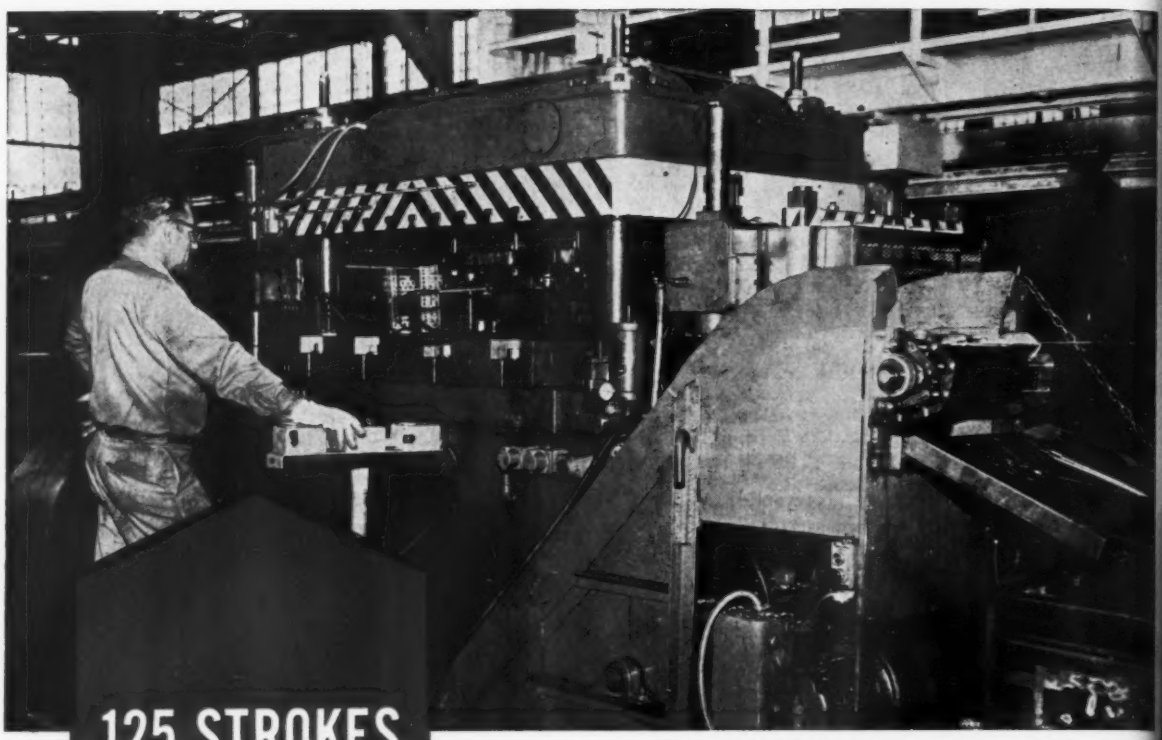
Selection includes: floor, bench or multiple spindle machines equipped with standard or production table, standard or Rockwell Power Feed, key chuck or tapered spindle, high or slow speed.

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 33



This Henry & Wright Double Crank Dieing Machine has been in constant use for three years with negligible maintenance costs. It is used on a wide variety of jobs with almost daily die changes.

125 STROKES PER MINUTE on a 300 TON PRESS with a 6″ STROKE

This is a lot of strokes per minute for a 300-ton automatic press especially on a part requiring a 6″ stroke. This is one of the reasons why The Budd Company, Philadelphia, chose high production Henry & Wright Dieing Machines. They also needed flexibility for a wide range of short-run jobs; accurate die guiding to assure minimum wear on expensive, multi-stage progressive dies averaging 8-stages each; automatic material feeding and parts ejection; quick and easy die changing . . . all so necessary to stay profitable in the highly competitive stamping business.

You'll find Henry & Wright machines will meet every production requirement. The 6″ stroke, high tonnage job described in the headline is a severe test for any heavy automatic press. If you need more production, at competitive costs, for a variety of jobs, ask now about the high production Henry & Wright machines. Your inquiry will receive our prompt attention. Sizes from 25 to 500-ton capacity.

MMT-PE — MODERN MACHINE TOOLS — PRODUCTION EFFICIENCY

THE HYDRAULIC PRESS MANUFACTURING COMPANY
A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.

HPM

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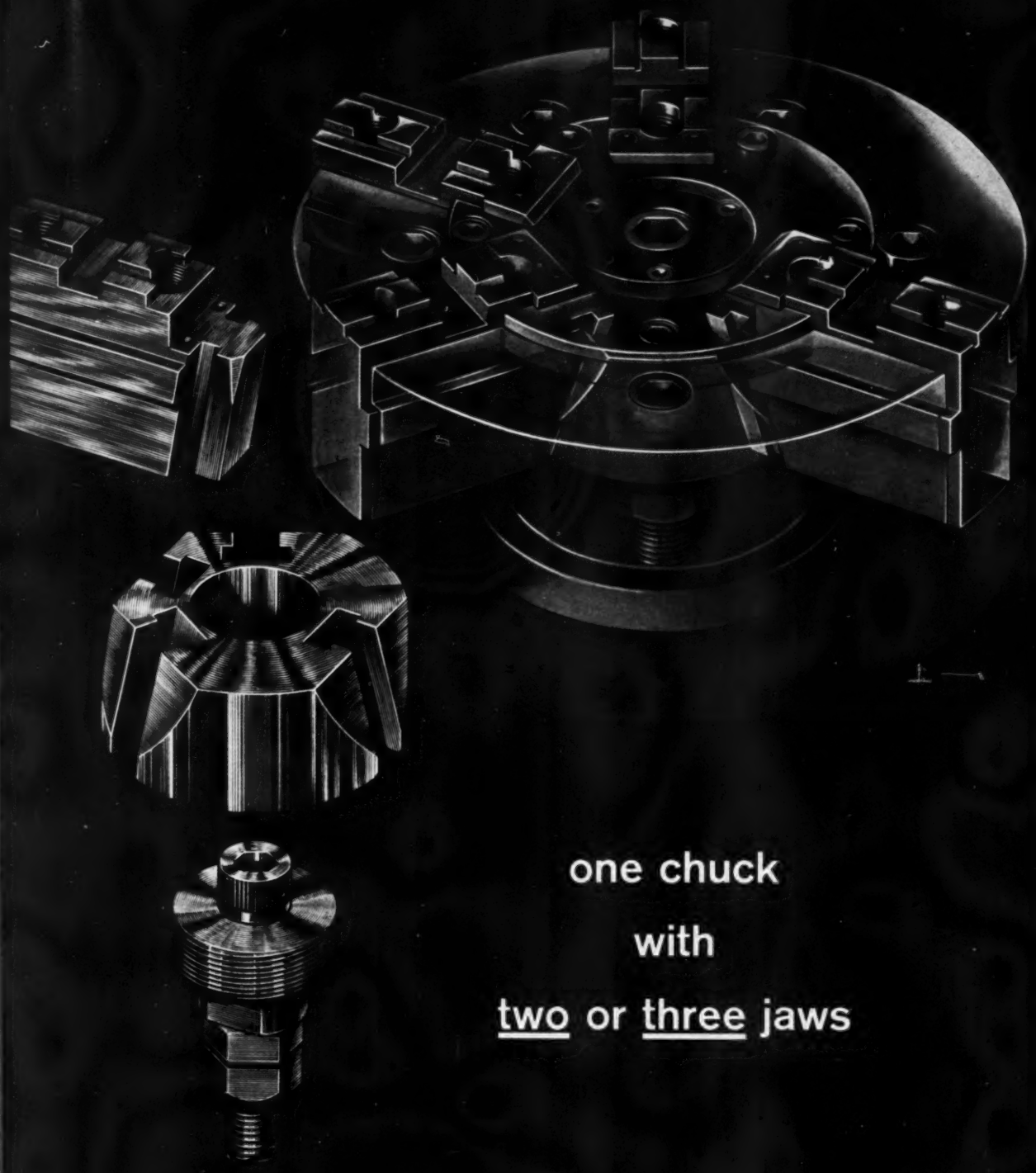
CIRCLE INFORM-A-GRAM KEY NO. 34



one chuck
with
two or three jaws

SKINNER DUAL PURPOSE POWER CHUCK

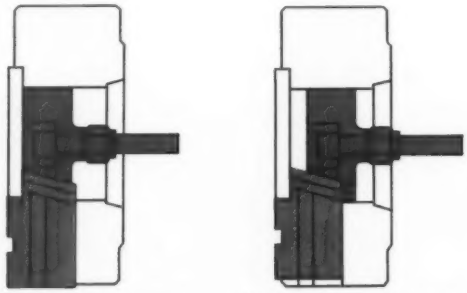
One Dual Purpose Power Chuck saves the cost of an additional chuck

Skinner dual purpose standard power chuck is designed with four master jaws so that it may be used as a two or three jaw chuck. It is no longer necessary to pay for one chuck to machine round work, and an additional chuck to machine odd shapes and castings. Not only do you save the cost of an additional chuck but you get all of the advantages of Skinner power chuck design listed below. Skinner dual purpose power chucks are available with adjustable, non-adjustable, or serrated jaws, in sizes 8″ to 36″.

A—Transparent view of dual purpose power chuck B—Mast
C—Wedge D—Drawbar Stud and Wedge plug

Skinner wedge-type chuck offers these advantages

- Allows automation of long production runs.
- Reduces operator fatigue—air performs the muscle work.
- Adjustable gripping pressure—air pressure can be adjusted for light or heavy chucking—is not left to the judgment of the machine operator.
- Work can be gripped internally or externally.
- Assured continued high accuracy because of wedge design (see illustration).
- Reduced wear because of hardened parts—models available with flame hardened center hole and jaw locks.
- Complete line—heavy and light duty models in sizes from 4″ through 36″.

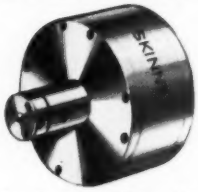


Wedge at top of stroke—jaws fully open (External gripping)

Wedge at bottom of stroke—jaws fully closed (External gripping)

The wedge and three jaws—only four moving parts—operate as a collet does with accuracy maintained over the whole range. The wedge angle is 14° which was found to be the most efficient angle for maximum power and jaw travel. With this wedge construction, the grip of a Skinner power chuck holds as set—even if the air line is broken—until opening power is applied in the opposite direction.

Skinner Power Chuck Accessories



Double-Acting Rotating Air Cylinders for use with power chucks and fixtures provide maximum pressure with a minimum amount of air. Cylinder walls are burnished to provide maximum sealing life. Cylinders in sizes 6 to 18 with semi-steel bodies are designed for low speed operation. Aluminum body cylinders in sizes 4 to 20 are designed for high speed operation.

Packaged Power Chucking Assemblies are available for Atlas, Cintilathe, Hardinge, Logan, Regal, Sheldon, South Bend, and many similar lathes. Assemblies are also available for Brown & Sharpe and similar automatic and hand screw machines to permit chucking of cold drawn parts, small or odd shapes and castings. Packaged assemblies consist of chuck with two or three jaws, threaded drawbar or drawtube, rotating air cylinder, cylinder adapter and necessary mounting for the individual machine.

Power Chuck Fixture, air or hydraulically operated, holds work for drilling and milling machines and for other bench and machine installations. Available in many jaw types in sizes 5″ to 36″.

A Complete Line of power chucking accessories includes hand, foot, and solenoid valves, drawbars, air units, and soft blank top jaws.

* * * *

For complete information about the Dual Purpose and other power chucks and power chuck equipment, contact your Skinner Representative, Distributor, or write us at the address below.

SKINNER CHUCKS ®

THE CREST OF QUALITY

SKINNERCHUCKS

SKINNER-HORTON CHUCK DIVISION
SKINNER PRECISION INDUSTRIES, INC. • NEW BRITAIN, CONNECTICUT, U.S.A.

PRINTED IN U.S.A.

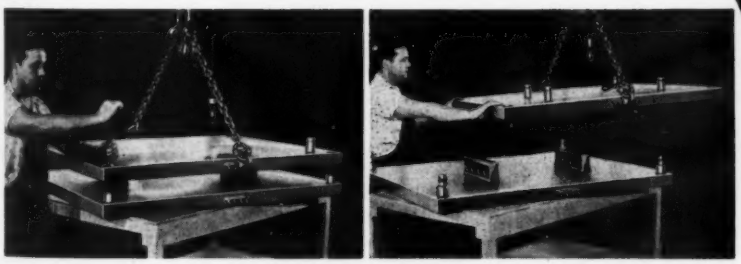
THIS IS ALL YOU NEED TO PART A SUPERIOR DIE SET EQUIPPED WITH *Removable Cap* GUIDE PINS

A Flick OF AN ALLEN WRENCH

loosens the socket head screws—the removable caps are pushed up through the bushings . . . then the punch holder virtually floats on the guide pins. That makes it a simple matter to lift the punch holder off the die shoe. Tilting or uneven lifting is not a factor when removable cap pins are used. THERE'S ABSOLUTELY NO TROUBLESOME BINDING IN PARTING DIES.

No Die Set Smash-Ups
Should foreign matter cause pin and bushing seizure, the socket screw pulls out of retaining washer . . . then the matching taper of pin and cap act as guide to prevent costly die damage.

WRITE FOR 24 PAGE CATALOG



One man parts large die set in a few minutes with Superior Removable Cap Guide Pins

NOW ON ALL SUPERIOR DIE SETS IN DIAMETERS FROM 1½" UPWARD AT NO ADDITIONAL COST.

SUPERIOR
DIE SET CORP.
2754 SO. 19TH STREET MILWAUKEE, WISCONSIN
AND CHESHIRE, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 36

CIRCLE INFORM-A-GRAM KEY NO. 37

JUDGE FOR YOURSELF

Many cost-conscious people at the Machine Tool Builder's Show, viewed the feature-loaded Famco line with amazement. They watched, they judged and they bought.

Famco equipment can save money in your shop. Send for your Famco brochures today!

FAMCO MACHINE COMPANY KENOSHA, WISCONSIN

PLEASE SEND ME THE FOLLOWING BROCHURES:

- ☐ Hydraulic tracer mills
- ☐ Power presses
- ☐ Vertical milling machines
- ☐ Arbor and foot presses
- ☐ Power squaring shears
- ☐ Air presses
- ☐ Hydraulic presses

Name_____ Title_____

Company Address_____

City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 38

ISA Meets Next Month

St. Louis will host the Winter Instrument-Automation Conference & Exhibit of the Instrument Society of America Jan. 17-19. Topics to be covered in technical sessions include strain gages, data handling, and some that are classified under the newly-formed Measurement Standards Division of ISA.

Chips 0.0001 Inch!!

Precise finish boring of steel or cast iron, with chips as fine as 0.0001, can be obtained by using either ceramic or titanium carbide cutting edges bonded to Microbore tooling system cartridges from the Microbore Div. of DeVlieg Machine Co., Royal Oak, Mich.

Tests recently concluded indicate that on steel, the coefficient of friction between the part and the cutting material, at a feed of 0.003 ipr, is so low that light cuts can be made with little or no danger of work heating.

With all rigidity conditions observed, plus the rigidity provided for the tipped cartridges by the cone seat and axial locking force, aluminum oxide and titanium carbide tips were found to withstand extremely high surface speed. The high speed produces better finishes than either high speed steel or conventional carbide cutting edges.

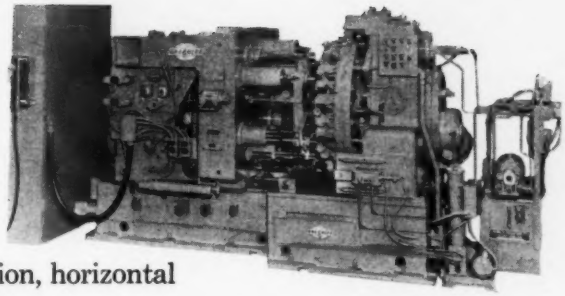
A definite decrease in machine cycle time was possible due to the higher surface speeds, and longer tool life resulted because of the extreme wear resistance of both cutting materials. Average speeds noted during the tests were 14 fpm.

In bonding tips of both types of cutting materials to the cartridges, DeVlieg used an epoxy resin cement instead of normal brazing methods. The cement remained stable at temperatures normally encountered in finish boring. But when temperatures exceeded 700° F, the stability of the bonding agent was affected. Thus discretion is advised when employing cartridges tipped with these hard cutting edges for roughing.

Tool geometries commonly used with conventional carbides are satisfactory for either the ceramic

... Continued on page 42

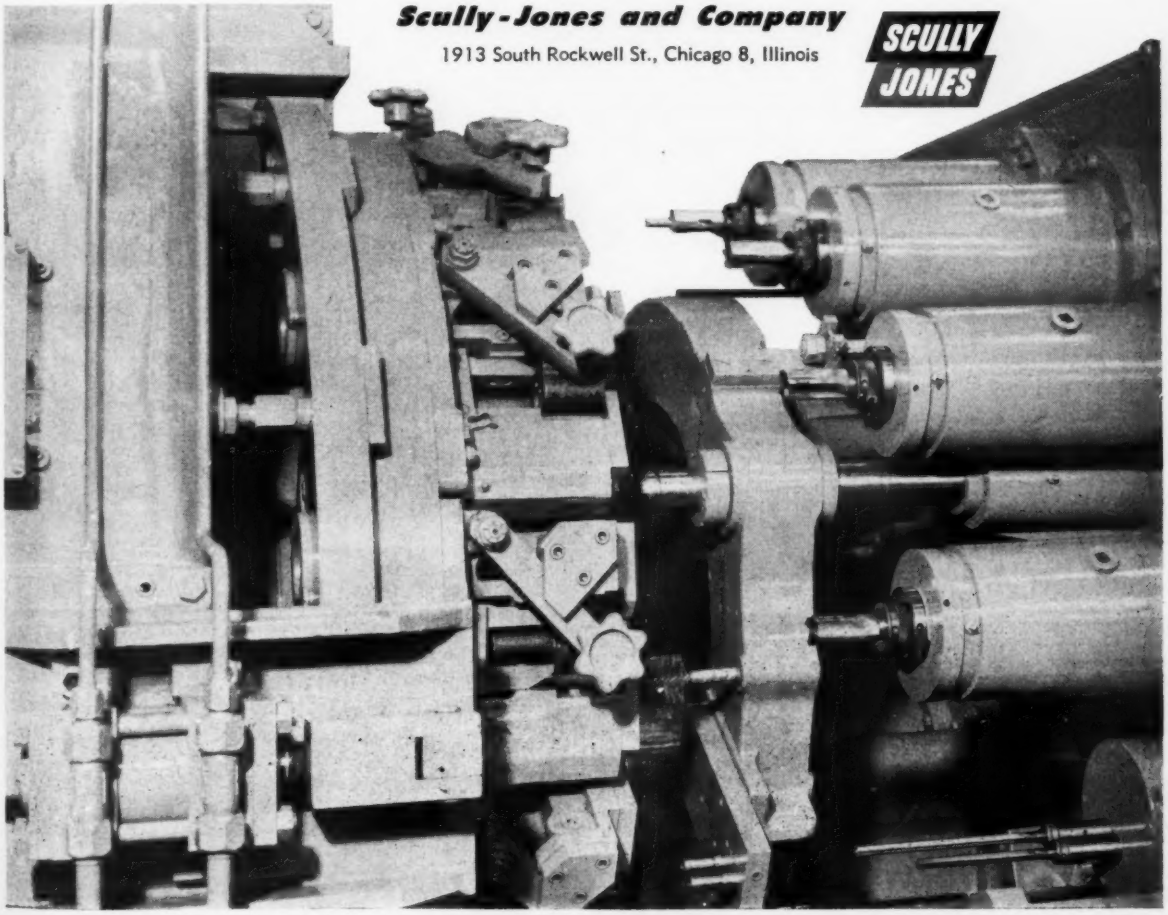
Return on money



invested in multiple-spindle machines often is controlled by *tooling*. Greenlee engineers recognize this — specified quick-change, preset tooling as original equipment on this 12-station, horizontal indexing machine. It operates at close to 100% efficiency, drilling, chamfering, boring, and reaming pump bodies at 97 per hour. Cycle time per piece is 37.2 seconds. Depth of bore is held to ± .001", ream hole size to ± .0005". Scully-Jones "Better-Hold" chucks speed tool changes and provide a rigid, concentric drive for the boring tools (not piloted). Tools are preset outside the machine. Patented "Lock-and-Eject" nut on end of chuck turns on ball bearings. The operator just twists it to quickly unseat the tool. Opposite rotation produces a powerful, self-centering fit that assures high accuracy and long tool life. Ask your Scully-Jones distributor or representative for details.

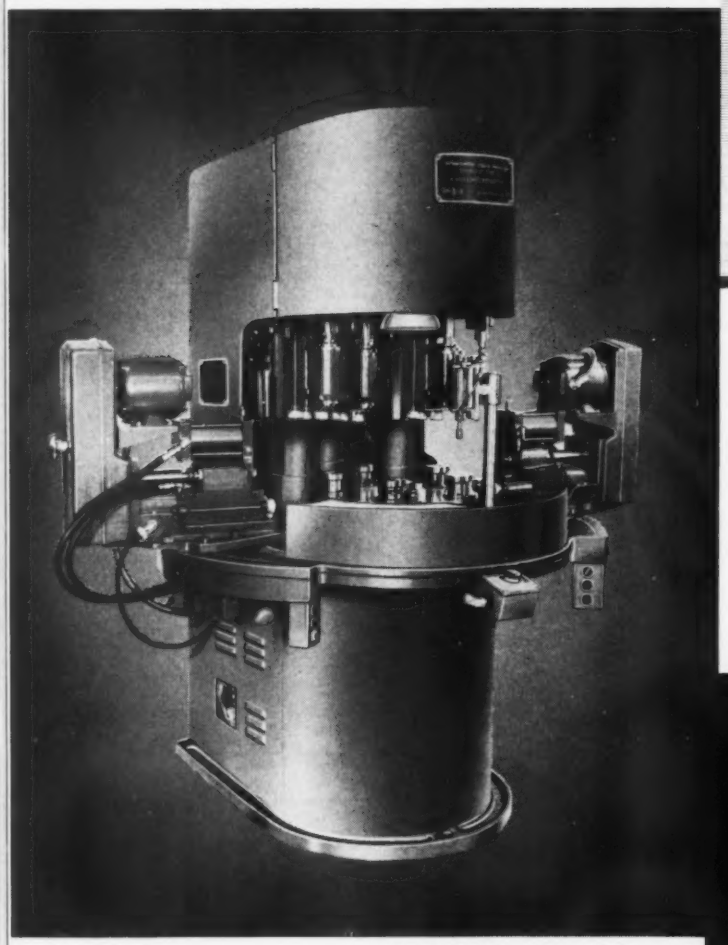
Scully-Jones and Company
1913 South Rockwell St., Chicago 8, Illinois

SCULLY JONES



CIRCLE INFORM-A-GRAM KEY NO. 39

Another Case History From Standard Tool

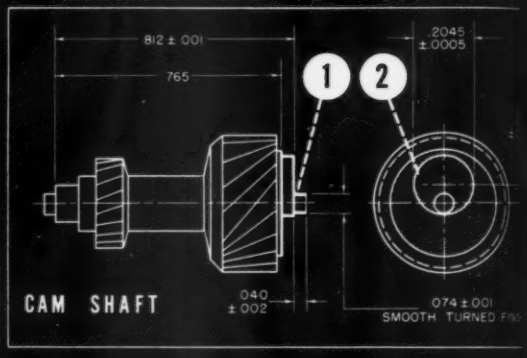


STANDARD TOOL'S NEW 2nd Operation Machine

says **Bill Iversen**

at Bell & Howell Co.

"Never before has a machine tool investment paid off so fast. This new machine, in addition to proving itself on our eccentric cam shaft, is so easy to set-up that it now handles an entire group of second operation work. Our methods department is still finding new jobs to process thus increasing its usefulness in our continual cost reduction program. This Standard Tool machine has conclusively established itself as one of the most profitable pieces of equipment we have ever installed."



PROBLEM:
To reduce the high cost of producing one of our precision eccentric cam shafts which required over 2 minutes of hand screw machine time to chuck and turn the eccentric.

OPERATIONS PERFORMED

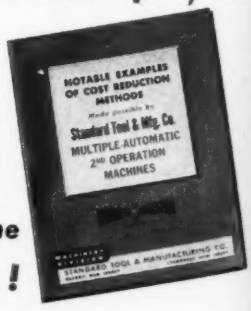
① Turn to .074" ± .001 dia. and face to .812" dim.

② Eccentric turn .2045" ± .0005 and face to .765" dim.

New precision machine tool performs multiple secondary operations simultaneously at 286 pcs/hr.

● With the *Standard Tool* automatic chucker, Bell & Howell's actual production time for this turning operation was reduced 90%.

Find out how the *Standard Tool* automatic chucking machine can help you realize savings too. Please send your part prints and allow our methods engineers to prove conclusively the savings you can realize. We will be pleased to demonstrate the machine's ease of set-up, versatility, accuracy, and cost reduction ability.



This Free Book details 30 typical cost-saving examples using Standard Tool 2nd Operation Machine

Write for your copy!

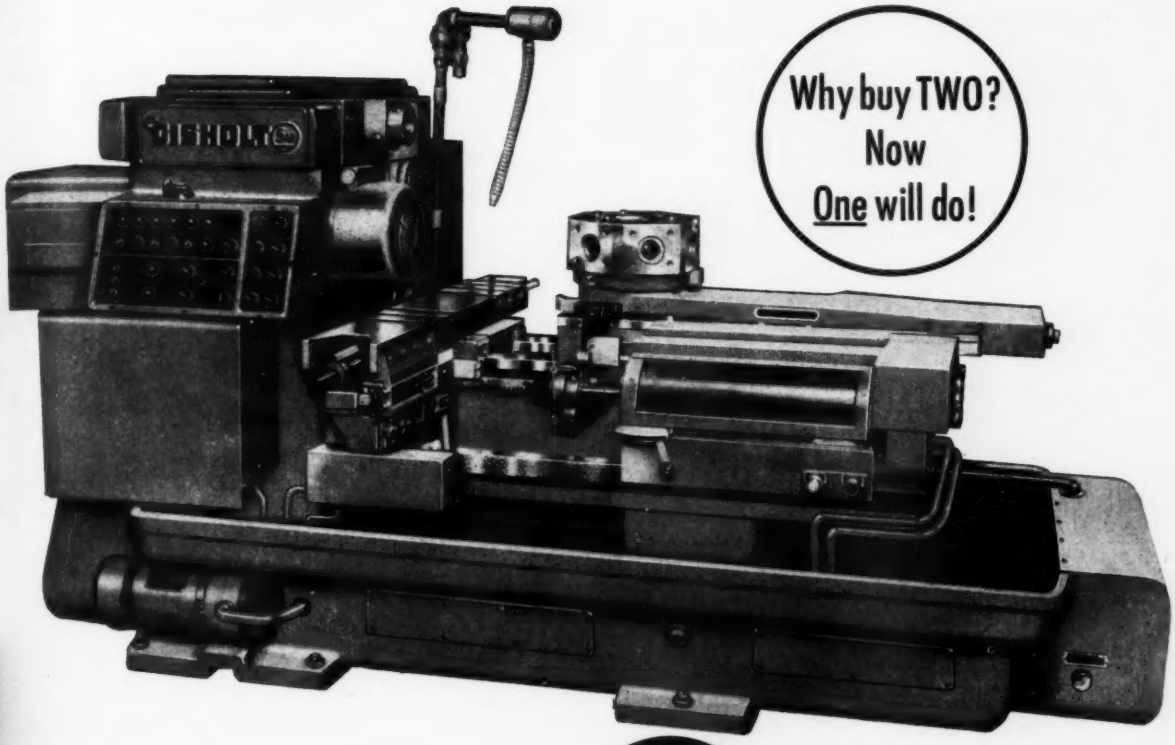
CIRCLE INFORM-A-GRAM KEY NO. 40

STANDARD TOOL AUTOMATION
Since 1910

MACHINERY DIVISION

Better Products at Lower Costs thru Better Methods!

STANDARD TOOL & MANUFACTURING CO.
706 SCHUYLER AVENUE LYNDHURST, NEW JERSEY



Why buy TWO?
Now
One will do!

the GISHOLT AR (AUTOMATIC RAM) TURRET LATHE

does both bar and chucking work

Why settle for less? The NEW Gisholt AR® (Automatic Ram) brings automatic cycle efficiency to both bar and chucking work—gives you low-cost automatic production at fixed rates on both small lots and long runs.

Here are some of the advantages this new AR gives you:

1. Converts in 1 hour from chucking to bar work.
2. Sets up as fast as any ram-type turret lathe—much faster than any other automatic.
3. Saves time with infinite feeds, 16 speeds, plus a 25 h.p. motor to take full advantage of carbides.
4. Machines more surfaces per chucking with: a hexagon turret and two cross-slide stations—up to a 15″ chuck—a 14″ turret stroke and 10″ cross-slide travel.

With this new automatic, even a new man can get consistent quality at fixed production rates. He simply chucks, starts the cycle and removes the finished part. On bar work he does even less.

Ask your Gisholt Representative for a desk-side demonstration showing how easy it is to set up and operate the AR. Ask him to explain the cost-cutting features that add up to increased profits on your work. Or, write for Catalog 1224.

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GISHOLT®
MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

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CIRCLE INFORM-A-GRAM KEY NO. 41

to cut your metal finishing costs—

OSBORN AUTOMATIC ROTARY INDEX MACHINE

features "building block" components arranged for completely automatic finishing cycles

An automatic part load/unload and turnover mechanism is the latest addition to Osborn's Rotary Index metal finishing units. This feature eliminates the need for production machine operators—and means regulated work flow plus higher production rates.

Most significant feature is the use of a *standard* index table and *standard* finishing heads easily tailored for efficient, economical *automated finishing* operations.

Other advanced design and construction features make these Osborn Metal Finishing Machines worth your immediate investigation.

Your Osborn field specialist has latest application data on a wide range of cost-saving finishing methods. An Osborn Analysis—made in your plant now at no cost or obligation—is the first step to pinpoint savings in *your* operations. Write or call *The Osborn Manufacturing Company, Dept. L-8, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

OSBORN®

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Chips from page 38

or titanium carbide cutting edges. They recommend a minimum conical radius of 0.015. Minimum clearance angles, in many cases less than those used with carbides, should be used. Where possible, lead angle tools are advisable to reduce entrance shock of the cutting edge into the workpiece. It is also helpful to tool life if a land of 0.002 is honed on the sharp cutting edges at 45° to the cutting face.

Because of their hardness, tools tipped with either titanium carbide or ceramic should not be sharpened on silicon carbide grinding wheels, DeVlieg warns. For the tests, the cutting tools were sharpened on a Micropoint tool grinder, using a 320 resinoid bond diamond wheel and a mist coolant.

Tool Design Upgraded With Computer

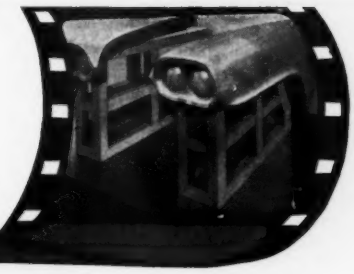
The Fellows Gear Shaper Co., Springfield, Vt., reports that better design is resulting since the firm began using a general purpose computer in its engineering department. The company manufactures gear shaper cutters and injection molding machines.

The rapid speed of the computer allows the engineer to explore the full range of design possibilities in gear shaper cutters, something formerly only approximated.

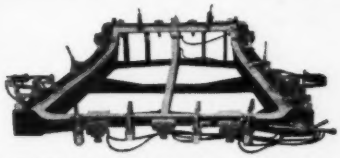
A total of 100 men utilize the computer, a general purpose G-15, made by the Computer Division of The Bendix Corporation. It's operated by a group of three men.

Problems include the calculation of spur and helical cutters for external and internal gears with unmodified or chamfered teeth. Calculation of the magnitude required for certain stresses in an injection molding machine, analysis of gear errors, and cost-pricing tables are handled.

TOOLING SAVINGS...



SAVED—$7,500 IN COST, 6 WEEKS IN DELIVERY!

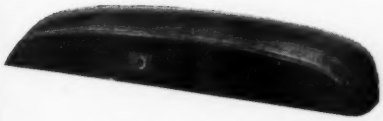


This hood welding fixture is a combination of steel base casting with a surfacing of Ren plastics. Prior to the application of epoxy resin, this fixture was tooled in steel at a cost of approximately $10,000 in 8 weeks. Today's cost in plastic—under $2,500; delivery in 2 weeks!

SAVED—$7,000 IN COST
6 WEEKS IN DELIVERY!

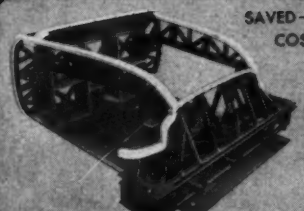
This hydroform die for an aircraft application is a mass casting constructed from a plaster mold. Originally quoted in steel at $10,000, 8 weeks delivery. Using Ren plastics, this die was fabricated in 10 days at less than $3,000!

SAVED—$4,000 IN COST,
2 WEEKS IN DELIVERY!



This mass casting, backed up by sand and gravel, is a form block for the rear roof of a bus. Patterned from a plaster mold, this casting was produced for $2,450—at a savings of $4,000 over conventional methods!

SAVED—$15,500 IN
COST, 6 WEEKS
IN DELIVERY!



This fixture is designed to check an overall front end automotive alignment. Completely fabricated of Ren epoxy laminating materials, glass, cloth and tubing, this fixture costs approximately $2,500 and was built in eight weeks. Former cost, using conventional methods $18,000; delivery in 3 to 4 months!

USING ren EPOXY RESINS

Plastic tooling saves both time and money—
often in surprising amounts!
For maximum benefits, start by selecting the proper application—and Ren epoxy resins.
Ren provides a background of extensive plastic tooling applications—plus 17 invaluable years of epoxy research and formulation.

For tooling applications that you suspect may be done faster—
more simply—at less cost—consult with your Ren Plastics representative.

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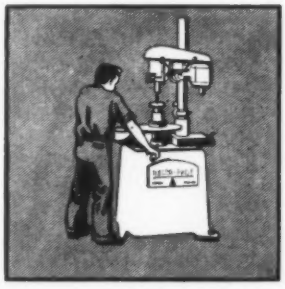
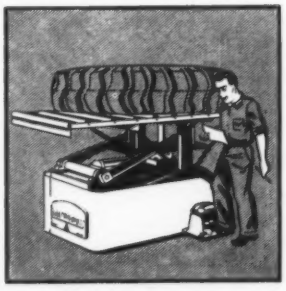
BASIC MICRO-POISE is equal to most rigid balance specifications.



Accessory drill presses or welding units allow correction on the machine.



Conveyorized or power loading models available for fast or heavy work-piece handling.

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PRECISION BALANCING MACHINES

Micro-Poise engineers are balancing specialists who know the problems of production and quality control. Micro-Poise speeds production, improves quality, at reduced balancing costs.

Micro-Poise machines balance—

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Clutches
Fans
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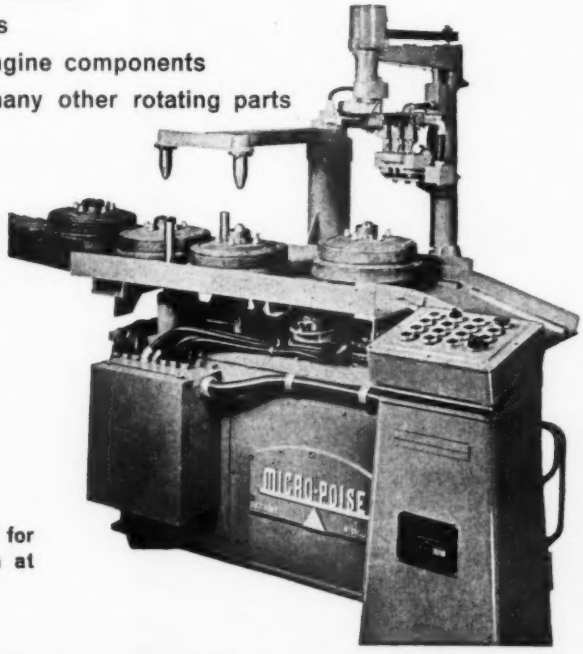
Brake drums
Pumps
Jet engine components

—and many other rotating parts



AUTOMATED MODELS for continuous production at highest production rates.

MICRO-POISE ENGINEERING & SALES CO.

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CIRCLE INFORM-A-GRAM KEY NO. 44

Another dollars and cents success story!

DODGE
of Mishawaka, Ind.
reports on its . . .

HAMMOND
Electrolytic Tool Grinder

It is a pleasure for us to report substantial savings since the installation of the Hammond Electrolytic Grinder.

We were using about 13 diamond wheels a year before this equipment was installed two years ago. The new process has so reduced wheel wear that we are using only the third electrolytic wheel since we purchased the Hammond grinder.

Our cost for wheels alone has been reduced by more than $7,000. In addition, one man previously assigned to tool sharpening has been released for other productive work.

Tool life has been increased materially, because little or no heat is generated in the new electrolytic grinding process. Damage previously caused to tools in the dry grinding process has been eliminated.

DODGE MANUFACTURING CORPORATION

Carl K. Shank

Carl K. Shank, Works Manager

Yes, in plant after plant, cost analysis verifies the substantial savings in carbide tool grinding that Hammond Electrolytic Grinders achieve. See for yourself. Send us today a few single-point tools to be ground. They'll be returned promptly to you with a "processing and time required report." No obligation.

Hammond OF KALAMAZOO Good Machinery Since '82

Hammond Machinery Builders INC.

1631 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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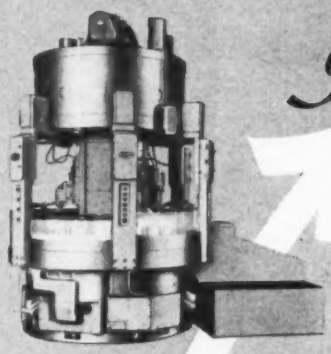
to cut costs when cutting metal...

You can't beat a

BULLARD

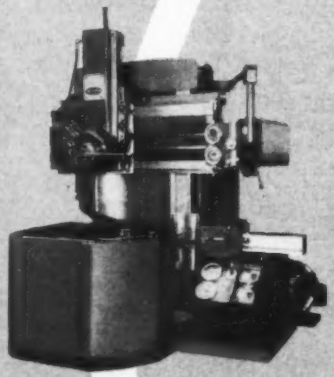


Mult-Au-Matic, Type "L"
10" with 6, 8, 12, or 16 spindles, 14" and 18" with 6 or 8 spindles.

Day in and day out — in metalworking plants around the world — modern machine tools designed and built by The Bullard Company are proving their ability to produce more in less time — thus, reducing the cost per piece.
It will pay you to investigate and compare the many advantages offered by modern Bullard machine tools.

The Bullard Company Bridgeport 9, Connecticut

Ask About Our Leasing Or Time Sales Plans

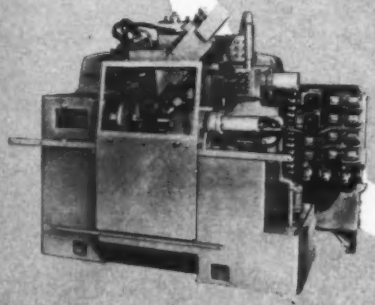


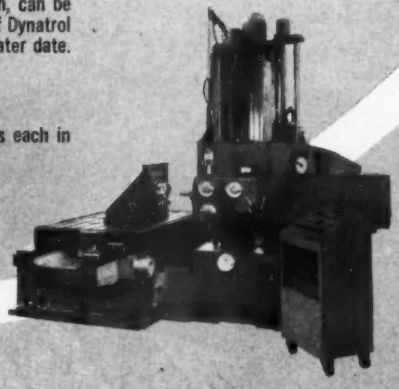
Dynatrol V.T.L. and Vertical Boring & Turning Mill
26" to 86" in 10" increments and 108", 124", and 144" table sizes.

Man-Au-Trol V.T.L. and Vertical Boring & Turning Mill
For fully automatic operation, can be applied to any or all heads of Dynatrol at time of ordering or at a later date.

Dynamill H.B.M.
In 3", 4" and 5" spindle size. Many combinations of bed length, table size and vertical travel.

Hydra-Feed Lathe
Automatic and tracer models each in four sizes.





Guest Editorial

On a recent morning, the CLEVELAND PLAIN DEALER, a major metropolitan daily newspaper, issued the following challenge to those responsible for our country's security — a challenge to keep the mouth shut. We are so used to having the best and the most of everything that to not so advertise seems unduly modest — totally un-American, in fact. However, in cases involving national security might it not be smart to refrain from telegraphing our punches? What do you think?

E. Willard Pennington

Editorial Director

We Talk Too Much

PUT IT THE OTHER WAY AROUND: Mr. Krushchev announces that the nuclear-powered Soviet submarine Lenin has put to sea with 16 thermonuclear missiles, packing more destruction than all the conventional bombs dropped by both sides during World War II, and capable of reducing 16 American cities to rubble. The Russian press carries pictures of the epochal departure, and Mr. K announces that the Lenin and the ships to follow her possess such power and relative invulnerability that any attempt to attack Soviet Russia would be suicidal.

Would we consider this a provocative act? Would our nerves, already strained, begin to jump until action of some sort or other would almost seem a relief? Would we find ourselves getting nearer and nearer to the point of explosion, which, in this atomic age, could end the world as we know it?

Certainly, the George Washington, our first nuclear-powered submarine, had to go to sea with its death-dealing cargo. In these days of uncertainty and danger every step must be taken which will discourage a nuclear war. But why, in the name of heaven, couldn't the submarine have slipped out quietly, with no publicity, no speeches, no pictures, no whoop-la whatsoever? Why give Krushchev the opportunity to tell the world about our "warlike intentions?" Why, indeed, save him the trouble of having his spies find out that the George Washington had started a long tour of duty?

It's a good bet that interservice rivalry was responsible to a large degree for the hurrah in connection with the George Washington's departure. The Navy had a big thing under way — and wanted all due credit. When the Air Force pulls a scoop it also wants credit. So do the other armed services. But such self-administered pats on the back do not make for calm reading in the Soviet, and when we announce that we will have enough B70's by 1965 to take care of all emergencies, we are quite possibly suggesting to Mr. K that it would be very foolish on his part to wait until 1965 before starting something.

While Americans know that we will never start a war, it may be difficult for potential enemies to believe this, in view of such things as the publicity in connection with the sailing of the George Washington. Such publicity, we imagine, was released for the purpose of announcing to the world that there was nothing secret in our preparations, and that this above-board announcement proved that we had no devious and ulterior motives. While this is 100% true, it may be hard for those who do not know us to believe.

The wisest thing for us to do, in our opinion, is to continue with every endeavor which will strengthen this country's military potential, and while doing this, to keep our mouths shut!

★ ★ ★

Hughes two-axis control system, with positioning table, can be retrofit to almost any kind of drilling machine—single or multiple spindle—or to any other type machine requiring two-axis positioning.

Hughes numerical controls will reduce lead time, eliminate complex jigs and expensive tooling, and increase the productivity of your machine. And, they are easy to operate and service!

The Hughes Positioning Table is automatically operated from pre-programmed taped instructions. The table positions at a rate of 150 inches per minute; has repeatable accuracy to within 0.0002". Measuring circuit and drive motors are fully integrated.

Installation of this proven system is simple and fast. In many cases, all it takes is one day.

To find out more about how Hughes numerical controls can increase your profits, write, teletype (TWX INGL 4117) or call collect: Hughes Industrial Systems Division, P.O. Box 90904, International Airport Station, Los Angeles 45, California. For export information, please write: Hughes International, Culver City, California.

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HUGHES

INDUSTRIAL SYSTEMS DIVISION
HUGHES AIRCRAFT COMPANY

NOW! a numerical control package that can be retrofit to your present machine tool

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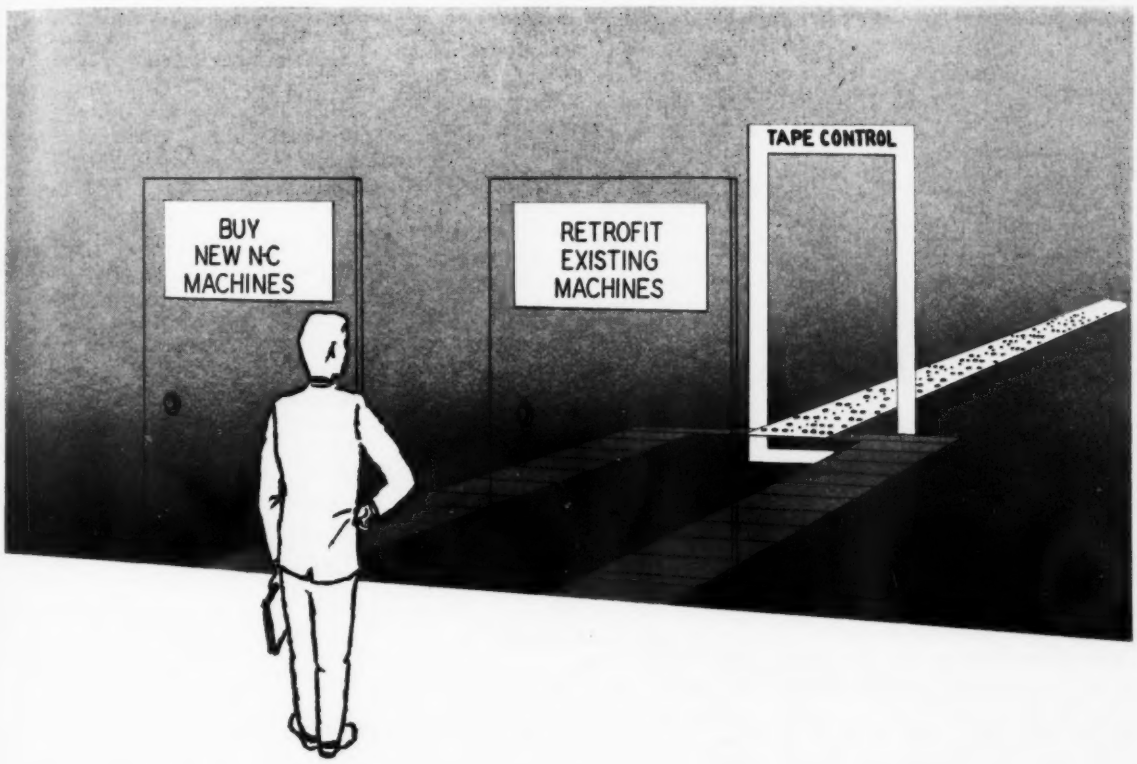

Which Door to Tape Control?

by Charles Weiner
Associate Editor

What's the best way to get into numerical control? That's the question uppermost in the minds of many metalworking companies. In this special Tooling & Production report, Associate Editor Charles Weiner examines the possible approaches to tape control and reports on his comprehensive survey of machine tool builders and control manufacturers. Many comments by industry leaders will help you understand what's involved in the transition to tape.

TAPE CONTROL Has come of age. Notice that numerical control was about to outgrow its adolescence and emerge as a full grown phenomenon was served on visitors at the Chicago shows last September. The clicking of tape controlled machine tools started wheels turning in the heads of production men. As a result of the shows, companies are no longer asking "What's in it for us?" They are now anxious to know how they can get into it.

The paths to tape control are varied, and not always clearly marked. What might be a sound approach for one company may be impossible for another. The "correct" way to get into numerical control depends on the economics of the application — and the economics are liable to change as progress is made.

Changing to tape controlled production involves the same standards that must be applied to any change in production method or purchase of new equipment. The proposed move must be justifiable. Some companies, in evaluating their needs, will correctly decide against entering into numerical control; others will be justified in going numeric, if they keep in mind that it is not a wonder drug.

Once a company decides to use tape control, it must choose the most advantageous method to make the transition. Choices usually boil down to purchasing new machines designed for numerical control, or converting machines already on the shop floor to operate by numerical control.

New N-C Machines

After careful evaluation of their needs in respect to N-C, many companies will decide to purchase a new machine, or machines. They have the choice of a variety of numerically controlled machine tools made by reputable machine tool builders. These machines cover a wide cost and complexity range, from small drilling machines with two-axis tape controlled tables, to large contouring machines with extensive tape control features.

Many of the new machines have designed-in numerical control, and are capable of optimum programmed performance. On some, tool selection and change is automatic, dictated by the tape.

Some machine tool builders offer their machines with a choice of control systems made by different N-C component manufacturers. Others are teamed up with just one control manufacturer, while still other builders make their own control system designed around the machine.

The purchase of new N-C machines, where feasible, will provide an effective entry into numerical control. New machines have the advantages of long life, versatility, speed, low maintenance, and the benefits of additional efficiency.

The Retrofit Approach

For companies that can't justify the purchase of new machines, conversion of presently owned machines might be the ticket to tape control. This approach has been dubbed "retrofitting," after the aircraft industry's practice of "retroactively fitting" newly designed parts to replace older components in a nearly completed airplane assembly. In the early stages of numerical control, before machines were specially designed for tape operation, all prototype control systems were retrofitted, i.e., applied to existing machines.

Today, the retrofit approach to tape control is widely debated — and for good reason. Illusions about the possibilities of retrofitting, and ignorance of the pitfalls, tend to lead many companies astray. At the same time, overemphasis on the weaknesses of retrofitting can mask the unique potential it may hold for some companies. The current widespread interest in the possibilities of retrofitting as a quick and economical way to get into numerical control justifies an analysis of the present status and potential of this approach.

Status of Retrofitting

Accurate figures on the number of retrofit installations already in operation are not available. However, many companies have reported that they are successfully using retrofitted machines. Extensive programs are underway in several companies. One large machine tool builder is retrofitting a whole line of his jig borers, and

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William C. Leone
Vice President & General Manager
Electronics Div'n
Rheem Manufacturing Co.

"The major obstacle standing in the way of wider applications of retrofitted controls is the cost of the job engineering required on the mechanical portions to adapt controls. Machines which are to be retrofitted were initially designed before numerical controls were available and in most cases, before the numerical control technology was conceived. Consequently, the machines reflect no thought of future possible accommodation of control elements so that drive and positioning members are not readily accessible for conversion. New machines being introduced are more amenable to the requirements of economical retrofitting. Therefore, retrofitting for complete conversion of a machine to numerical controls will probably not make a significant impact until the new generations of machines are phased in. The solution most probably lies in retrofitting to partial conversion in the interim period — this partial conversion being the adaption of position indicators and read-out devices which give some of the benefits of numerical controls but go only part of the way in still requiring manual (including push-button) control of the drives."

Stephen C. Clark, Jr.
Application Engineer
Metalworking Program Control
Specialty Control Dept.
General Electric Co.

"The question of retrofit with numerical control continuously arises. Our experience on at least half a dozen machines of all types has been that retrofit is not economical. To make full use of the accuracies and performance available from numerical control requires careful thorough engineering analysis and possible modification of machine characteristics. This is much more costly on an old machine than if the same analysis were made on a new machine as it is being designed.

"Even the very best control cannot compensate for some of the machine deficiencies which could be taken care of by the manual dexterity of the operator. The mere addition of numerical control to an old machine does not completely replace the operator and his abilities to compensate for these deficiencies. It is inevitably cheaper to buy a new machine integrated with the numerical control.

"A problem of divided responsibility often occurs with the do-it-yourself approach by the user. He should contact a reputable machine tool builder who is properly equipped to work with a numerical control supplier to provide a numerically controlled machine tool system. The potential cost savings of numerical control is so tremendous it should never be hampered by less than complete utilization of both control and machine capabilities. Retrofit does not assure this."

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the Bureau of Naval Weapons is currently evaluating four specific retrofit installations of production milling machines. The Department of the Navy's interest in retrofitting was expressed in 1957 when it asked Stanford Research Institute to investigate the technical and economic feasibility of applying numerical controls to machine tools already in service. The investigation produced an authoritative 116-page report by Peter D. Tilton of SRI titled "Retrofit Applications of Numerical Control for Machine Tools." Mr. Tilton's report is still regarded as an excellent guide for serious analysis of retrofit applications.

Confidence in the potential of retrofitting has spurred the formation of several new companies specially staffed and equipped to make the necessary machine modifications, and to install the control systems on rehabilitated machines. Many companies take a more dismal view, including machine tool builders, who see no future for retrofitting. Some think that because of limitations imposed by wear and design of machines in service now, there is a possibility of excessive costs in converting older machines. They warn against investing in a conversion which, at best, cannot equal the performance of a new machine specially designed for tape control.

Each Application Different

A blanket statement on the advisability of retrofitting is hardly possible, due to the various considerations involved in each application. Condition and age of the machine, accuracies required, technical skills available, ultimate use of the machine, and cost of the control system vary in each case. In some applications the costs would be prohibitive, while in others a relatively simple, inexpensive conversion is possible. The technical requirements for good operation of a numerically controlled machine must be understood before any evaluation of a specific retrofit application can be made.

Converting a machine to numerical control is not simply a matter of "slapping" new controls on the machine and letting the tape take over. The machine and the control must be considered as a unit, and the overall performance measured in terms of the combined machine-control system. In retrofit, applications, the limiting factor will almost always come from within the machine.

L. M. Cole
Vice President — Sales
Warner & Swasey Co.

"Numerical positioning control is through the first phase of its development in which it has been new, different, exciting and is entering the second stage in which it will begin to be accepted as a common way of controlling certain types of machining operations. It will lose its glamour but will pick up solid economic justification in the years ahead. Numerical path control, because of its greater complexities and expense, may still be many years away from common machine shop usage. Its applications for today and the near future will be largely limited to problems of extremely complex shapes in short runs.

"Retrofitting seems to be perfectly feasible for some table positioning applications, although installation problems can often be considerable."

T. R. Lawson
Manager
Industrial Control Dept.
Westinghouse Electric Corp.

"I doubt if the retrofit approach is very feasible without considerable reworking or rebuilding of the tool. It has been done in some cases economically. In other cases the rigidity of machine structure for accurate repetitive positioning would preclude a satisfactory retrofit program. Each case would have to be considered on its own merit."

Machine Condition Important

The condition of the machine to be converted is of critical importance. Wear and mechanical performance of a particular machine depend on its age and past use, and maintenance procedures employed. If a machine is excessively worn, and exhibits marked mechanical difficulties, it probably should be replaced by a new machine, and would not be a candidate for retrofitting. The most likely candidates for retrofitting are machines of recent vintage which have been kept in good mechanical condition through a preventive maintenance program.

Even a machine in relatively good condition will require some rehabilitation before numerical controls can be effectively applied. The work required depends on the condition of the machine, and may involve replacement of worn components, rescraping of ways, installation of new screws, or complete rebuilding. These steps are necessary to reduce friction, backlash, runout, misalignment, and other factors that may limit its response to the servomechanism control system and—consequently accuracy. A punched tape can do many things, but unlike human operators, it cannot compensate for inherent machine inaccuracies.

Rehabilitation not only provides effective functioning of machine components in relation to the servo controls, but also adds to the service life of the machine. Extension of service life is particularly important because of the large conversion investment, and the increased load the tape controlled machine will carry due to its improved capabilities.

Servo System

Modification of the machine is another important step in retrofitting. Independent feed drives must be supplied for all motions to be controlled. Each controlled machine axis must be powered by a separate servo drive, and the drives properly coordinated with the controls. Further modifications will be required in some cases to reduce friction and increase stiffness so that the servo system will function properly.

Selection and installation of the measuring and controlling apparatus is the final step in converting to numerical control. An appropriate system for the intended application must be used, and it must be compatible with the capabilities of the rehabilitated and modified machine. Installation is complicated, requiring the utmost care to insure optimum performance of the machine-control system.

Expert Help Required

After even a quick glance at the complexities of rehabilitation, modification, and installation, it's plain to see that retrofitting is definitely not a "do-it-yourself" affair. To be successful and economically justifiable it should only be selectively applied after careful evaluation. Converting a cur-

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Charles B. Pickering
Product Manager
Numerical Control System
Diehl Manufacturing Co.

"A brief review of the National Inventory of Metal Cutting equipment and a survey of the user who has developed an interest in Numerical Control gives positive evidence that the problems of retrofitting will have to be faced.

"It seems that there will be at least two approaches. The machinery manufacturer who provides his own control will handle the retrofit job and assume complete responsibility. The other logical approach, particularly from the standpoint of the control manufacturer, is to establish independent retrofit agents or specialists, strategically located in each key market area, who will have the capability of handling the retrofit installations.

"Retrofit is going to be an important part in the future growth of the numerical control industry, and as such, reasonable answers to the problems involved will have to be determined."

H. B. Kolm
General Manager
Industrial Div'n
Moog Servocontrols, Inc.

"Simple point-to-point controls may be successfully applied to existing machine tools which are in good condition. Considering the large machine tool population and the general attractiveness of a low-cost approach to numerical control, the retrofit market may well be one of the largest over the next few years."

rently producing machine means taking it out of service while the necessary changes are made. The temporary loss of production must be considered. Another area that should not be overlooked is the need for proper servicing and maintenance of tape controlled machines. This is extremely important, requiring experienced personnel, especially in the case of retrofitted units.

Who Handles the Conversion?

Proper evaluation of a potential retrofit application, and its subsequent conversion and installation, requires the services of experts in the fields of both machine tool building and control system engineering. Since retrofitting involves the installation of new controls and servomechanisms on a machine tool which must be rehabilitated and modified, responsibility falls on the machine tool builder, the control manufacturer, the machine rebuilder, and the user. Which of these groups, or combination of groups, should be responsible for the conversion is a debatable question. If, for example, the machine tool builder took responsibility for everything but the installation of the control system components, and the control manufacturer handled only the controls, to whom would the user turn when he runs into difficulty? A potential retrofit customer would be wise to get a commitment of responsibility from *one source* for both the machine tool and the control system.

Future Trends

Most people in the industry agree that if retrofit applications increase, the trend will be towards relatively simple point-to-point positioning systems, rather than the more complex continuous path contouring systems. Two-axis control would be the least expensive of these applications, and the easiest as far as tape preparation goes. In some cases, a new tape-controlled positioning table may be bought as a package, and added to the basic machine. This approach will be effective only if the machine is rigid enough to support the extra weight of the N-C table. If the basic machine table is flat enough to avoid distortion by the addition of an N-C table, and if spindle accuracy is of the right order, fine.

Conversion of a group of machines of the same type may prove to be more economically and technically feasible than conversion of a single machine. A battery of jig borers, made by the same company and in the same mechanical condition, would be easier to retrofit than a variety of dissimilar machines in different states of fitness. Several programs of this type are underway, and experiences of the companies involved should be of interest.

Buy Now, Add N-C Later

A third approach to tape control is possible. Companies who need a new machine, but cannot afford a new numerically-controlled machine now, might consider a new machine designed specially for numerical control, but capable of operation with conventional controls. These can be purchased with conventional controls, and the numerical controls can be added when the user desires it. Since the necessary power drives are already built into the machine, conversion to tape is more easily done. In most cases, however, the cost of the servo-controlled basic machine represents the major investment, as compared to the cost of the tape control unit. Some companies might want to consider extending themselves a little further to purchase the tape controls with the machine.

All Paths Lead to Tape

Some points to consider in choosing a path to numerical control have been briefly discussed here. Machine tool builders and control manufacturers will help you evaluate your specific situation and advise what path would be best for you.

A variety of control systems are available for new or retrofitted machines. An accounting of these systems and their capabilities is given in the special survey accompanying this article. Also included are comments on the approaches to numerical control by experts in the field. Bear in mind, however, that each application must be judged on its own merits.

Once you are in numerical control, regardless of your path, the time and cost-saving advantages will soon become obvious, after the initial adjustment period. Prepare for numerical control now, and once you are in it be prepared to load up your machines — they'll really produce.

Tape Control, continued next page

Survey Explores N-C Trends and Problems

RESULTS OF TOOLING & PRODUCTION'S special survey of machine tool builders and control manufacturers are presented on the pages to follow. The survey was designed to provide decision-making information to companies considering entry into the field of numerical control. Since there is currently much discussion about converting existing machines to tape, special emphasis was placed on determining the types of control systems available, their capabilities and cost, and the feasibility of retrofit applications of these systems. Forty-six companies (see list) participated in the survey.

To supplement the questionnaire, Industry leaders were invited to comment on trends in numerical control and the future of retrofit applications. Their statements, presented on these pages, reflect the wide divergence of opinion on this question.

Agreement on the need for more information on methods of getting into numerical control was evidenced by the excellent response of participants in the survey. The candid comments made by most companies reflected a keen interest in the problem areas of retrofit.

A total of 34 point-to-point positioning systems and 17 continuous path systems are available according to the tabulated answers. Others available include control systems for direct measuring, inspection, balancing, and custom units for specialized equipment. Most of the control systems are suitable for application to drilling, turning, milling, boring, and grinding machines; others can be applied to welders, punch presses, routers, riveters, gear cutters, and foundry sandslingers. Overall repeatable tolerances range from 0.0001″ on some systems to 0.002″ on others.

The cost of the controls to the user ranges from about $2500 for each axis controlled to about $10,000 for each axis. Many point-to-point systems are offered as complete packages (including necessary servo motors, etc.) at a cost of from $8000 to $15,000. Packaged continuous path systems are considerably more expensive.

Twelve companies gave costs for a complete retrofit conversion; they range from about $10,000 to $30,000. Many firms did not specify costs for controls, complete packages, or retrofit conversions; they preferred to quote on individual applications because of varying customer requirements.

The survey results show that of the large number of available control systems, a majority are offered as complete packages and are suitable for retrofit applications. Twenty-nine point-to-point systems and 14 continuous path systems meet these requirements. Most of the systems in this category can be purchased by machine tool builders as well as users.

Availability of control systems suitable for retrofit does not necessarily mean that suppliers of these systems recommend retrofitting. Some companies do not recommend use of their systems in retrofit applications, and many others recommend retrofit only when the particular application warrants it.

Another area of mixed feeling is that of responsibility for the different phases of a potential retrofit application. Most feel that the machine tool builder should take the responsibility for modifying the machine tool so that it can be operated with numerical controls, and that the control manufacturer should be responsible for fitting of the control system, debugging, and service. Others feel that the responsibility for different phases should be jointly assumed by the machine tool builder and the control manufacturer, or by either of these two parties and the user. Several companies suggest the need for retrofit specialists capable of making the installations and taking responsibility for the entire machine-control system.

Edward C. Grimshaw
Manager
Data Systems Dept.
Norden Div'n
United Aircraft Corp.

"There is a definite need for an intermediate step between present methods and full tape control. Both the machine tool and control manufacturer have tended to overlook the problems facing the small and medium-sized shop in making the transition to numerical techniques.

"One sound approach which I believe you will see more and more of is the application of position read-out systems. Unlike complete tape systems these display systems can be applied to almost any existing machine. They allow the user to realize an immediate increase in production without the large capital investment associated with a new machine fitted with a tape control system. They provide many of the benefits of full tape systems including improved repeatability and reduced setup time, but can be introduced in the shop with a minimum of operator training and reorientation of existing prints and procedures. Expandable to full tape control at a later date, they allow the average shop to walk into numerical control on a step by step basis."

Clark R. Hibbard
Sales Manager
Fosdick Machine Tool Co.

"The areas of application of numerically controlled machine tools will continue to be extended throughout the next few years as more machine tool users become aware of the true size of cost reductions in the metalworking industry which can be realized through the use of numerical control. This expansion will be aided by improved technology on the part of control and machine manufacturers and decreasing costs due to this increased knowledge and experience.

"Applications for retrofit are definitely present, but should be approached by the prospective buyer with extreme caution. The limitations of the retrofit approach are primarily due to the design of the machine which is to be converted to numerical control. Many older machines are definitely not good numerical control potential. Most of the machines being built today with numerical control as original equipment are designed to provide greater rigidity, better lubrication, along with other features which must be built in to assure accuracy, long machine life, minimum maintenance, as well as speed and ease of operation. There are, however, some standard machine tools available which have been designed with the idea of adding numerical control to them as a field-installed retrofit."

The major obstacles to wider applications of retrofitted controls, according to survey participants, are the mechanical limitations of existing machines not designed for tape controls and the high costs of a retrofit conversion. On older units, wear of machine members causes inaccuracies and less than optimum performance with numerical control. Some companies feel that in many cases the cost of modifying a worn machine would be excessive compared to the cost of a new machine designed for numerical controls.

Lack of understanding of the advantages of retrofit, and confusion as to who will take responsibility for the conversion, were among other obstacles cited.

Comments on the future of retrofit were candid and to the point. Some gave an encouraging green light to retrofit, others said approach it with caution, and still others flashed a discouraging red light. A representative selection of the comments is presented with the tabulated results of the survey below.

NUMERICAL CONTROL SURVEY

Tabulated Answers of Forty-Six Participating Companies

Totals do not always tally because some firms gave affirmative answers to more than one of the choices offered.

1. Do you manufacture numerical control systems for machine tools?
   - a. No 9
   - b. Components only 5
   - c. Complete package 36
   - d. Other (In development now) 3

2. What type of control system do you make?
   - a. Point-to-point 34
   - b. Continuous path 17
   - c. Other 8

3. Are your control systems suitable for retrofitting to machine tools?
   - a. Yes 32
   - b. No 5

Packaged point-to-point systems suitable for retrofit (1c, 2a, 3a) 29

G. S. Knopf
Manager
Industrial Controls Sect.
The Bendix Corp.

"There is a definite and positive trend toward the increased use of both positioning and contouring control systems. During the next few years, it is predicted that sales of numerical control systems will increase at a rate of fifty percent per year.

"Regarding retrofitting of existing used machines to tape control, it is generally not an economical move. Usually a substantial sum must be spent on a standard machine to restore it to 'like new' condition before application of tape control begins. The cost of restoration plus the cost of modifications required for the tape system will usually approach the cost, and sometimes exceed the cost, of a new machine specifically designed to obtain maximum benefits from tape operation. Apart from the restoration expense, the cost of application of tape control to a used machine can vary considerably with the type of control system used and, in particular, with the type of power drives and feedback employed."

R. H. Eisengrein
Vice President —
Electronics Div'n
Seneca Falls Machine Co.

"Retrofitting existing machines with numerical control can be economical and practical. However, the personnel making the decision must be experienced in both the control system and machine building field. The potential user of this equipment can smooth the transition from manual to numerical control by applying the latter to one of his simpler machines."

Packaged continuous path systems suitable for retrofit (1c, 2b, 3a) 14

4. What type of machine can the controls be applied to?
Most frequently mentioned: drill, lathe, mill, borer, grinder. Also mentioned: welder, punch press, router, riveter, gear cutter, foundry machine.

5. What is the overall repeatable tolerance of the system?
Range from 0.0001" to 0.002".

6. How many axes can be controlled?
In most cases at least three; many systems not limited — depends on machine and setup.

7. To whom do you sell the controls?
   a. Machine tool builder (OEM) 28
   b. Direct to user 24
   c. Do not sell except as unit with machines we build 8
   d. Other (Machine rebuilder) 3

8. What is the approximate cost to the user?
Controls only $2500/axis to $10,000/axis.
Entire packaged control system $8000 to $15,000 —(point-to-point); $20,000 and up — (Continuous path).
Complete retrofit conversion $10,000 to $30,000

9. What is the major obstacle standing in the way of wider applications of retrofitted controls?
High cost of modifying machines not designed for N-C and mechanical limitations and wear of older machines were most frequently cited.
Some representative answers follow:
"Wait and see attitude of customers."
"Existing machine not designed for optimum performance with N-C. Qualified retrofit extremely difficult to obtain; is out of control manufacturer's hands."
"Shafts not accessible, gear and thread ratios not convenient, not enough space."
"User must be educated to understand advantages."
"Not everyone in field will handle and be responsible for complete job; customer may be left 'holding the bag.'"
"Possibility of unreasonable cost for necessary modifications."
"Generally too expensive compared to buying a new machine designed for N-C."
"For good results should only be applied to machines in good mechanical condition — most machines aren't."
"As a general rule, machine tool is weakest link in system."
"Difficult to demonstrate, because of setups involved and size (transportation problems). In-

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David N. Smith
Chief Development Engineer
Jones & Lamson Machine Co.

"In considering retrofit on existing equipment, considerable caution must be exercised. Most conventional machines are not suited for hitching on numerical drive systems since the machine and the controls together must be completely compatible in their structural and dynamic characteristics in order to achieve satisfactory results. In a few types of machines where they can be stripped down to the basic beds and slides and power servos applied directly to the motions, retrofitting can be successful. In general, however, this is not possible without considerable rebuilding and turns out to be more expensive and less satisfactory than starting with a machine originally designed for the purpose."

E. McFerren
Vice President-Sales
Giddings & Lewis Machine Tool Co.

"We are finding the interest in numerically controlled machine tools and the swing-over to their purchase to be taking place more rapidly than was anticipated one to two years ago. We are encouraged by the realization on the part of the great majority of purchasers that numerically controlled machine tools must be new, integrated designs with full consideration given to the machine and its control making up one package. The concept of the black box addition in the retrofit of old machine tools has ceased to be attractive. Our customers now realize that numerical control success comes only through a completely integrated design with equal attention given to control features and machine mechanical improvements."

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dustry has few good electronic servicemen — customers fear maintenance."

"The idea that adding a tape controlled system should overcome inherent machine inaccuracies in addition to the increased production and elimination of human error obtained."

"Lack of competent engineering and shop personnel to take care of retrofit details on wide variety of machines."

10. In retrofit applications, who should take the responsibility for:

Machine Tool Modification
- a) Control Manufacturer 1
- b) Machine Tool Builder 18
- c) User 2
- d) Other (rebuilder or retrofit house) 1
- a) + b) 5
- b) + c) 5
- b) + d) 4
- a) + c) 1

Fitting Control System
- a) Control Manufacturer 16
- b) Machine Tool Builder 7
- c) User 0
- d) Other (rebuilder or retrofit house) 1
- a) + b) 6
- a) + b) + c) 1
- a) + d) 1
- b) + d) 1

"Debugging"
- a) Control Manufacturer 18
- b) Machine Tool Builder 6
- c) User 0
- d) Other (rebuilder or retrofit house) 1
- a) + b) 9

Service
- a) Control Manufacturer 11
- b) Machine Tool Builder 7
- c) User 3
- d) Other (rebuilder or retrofit house) 1

11. Do you wish to make any comments on the future of retrofit applications of numerical control for machine tools, the problems anticipated, and solutions to these problems?

Some representative comments follow:

"The future of retrofitting numerical controls to machine tools is open mainly to medium run production machines that only require accuracies in the order of $\pm$ 0.005. In this area it will prove to be highly successful."

"Why should anyone invest the money required for retrofit to be used on a machine designed for less refinement than is available on a machine equipped with controls."

"There definitely are places where retrofit can do an excellent job if tolerances etc. are not too

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Lou Ballard
President
Micro-Path, Inc.
Subsidiary of United Industrial Corp.

"There are at least 1,500,000 machine tools in use that should be retrofitted immediately with a magnetic or punched tape control system for optimum performance; countless other new equipment that could take advantage of these new automated techniques at time of manufacture."

demanding. But to make a brash statement that you can get all the way into numerical control by simply retrofitting control systems is to say that we can easily make 1960 automobiles from 1940 models. You have everything you need — the engine, transmission, wheels, controls — they are all there!

"Also, let's emphasize more what 'overall machine' accuracy versus electrical accuracy means! Overall accuracy is produced 'in the iron' and to achieve a given produced accuracy requires an accuracy in control components of the order of 1/10 the overall error allowed.

"No doubt, in some cases, retrofit might well be the 'foot in the door' for additional N-C equipment."

"In retrofitting machine tools with numerical control, it must be recognized that some parts of the existing machine must be 'beefed up' in order to withstand the additional wear and tear of high-speed numerical controlled operation. Compare this with driving an automobile at 80 mph, as opposed to driving it at 30 mph; the higher speed will cause greater mechanical wear, and so the machine should be built or modified to perform accordingly. Before a decision is made to apply a numerically controlled drive system to an existing machine tool, there should be a careful inspection of the machine and analysis of costs and performance by the user, the machine tool builder (or rebuilder), and the control manufacturer. This should be done to assure continuity of performance with the inherent high speeds and precise accuracy available with a numerically controlled drive system."

"Point to point positioning applications will far outnumber continuous path applications.

"If we define retrofitting to mean the application of numerical control systems to machine tools designed primarily for manual operation, rather than an integrated design, then applications whether OEM or at user's plant must be considered as retrofitting. The future of such business is unlimited.

"For some time to come, most machine tool builders in order to maintain lowest costs will be forced to retain a common design between manual and automated machines. Retrofitting will have to be resorted to when numerical control is desired by the customer."

"Difficulties often arise in respect of the responsibility for the ultimate performance of the retrofit tool. It is necessary for the areas of responsibility to be clearly defined and it seems desirable that the machine tool builder should inspect the machine and confirm that it is in an adequate condition for conversion. The machine tool builder is in the best position to make the ultimate conversion and to fit the control system. Debugging is a joint effort because in many cases there are inter-relationships between mechanical and control problems. Similarly, in the case of service, the responsibility is usually divided and the machine tool builder should take the overall responsibility, calling for the services of the control equipment manufacturer as necessary."

"Retrofit on a large scale by control people can only be accomplished by extensive retrofitting shops strategically placed nationally and having wide capability for machinery rebuilding."

"Machine tool rebuilders could capitalize on large potential market by specializing in retrofitting machines with numerical control."

"There is a definite lack of sophisticated retrofit or rework companies in the field."

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Participants in N-C Survey

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True-Trace Corp.
Wang Laboratories, Inc.
Warner & Swasey Co., The
Westinghouse Electric Corp.

An Editor Interprets (TP)

Part IV

by William E. Hoffman
Editor

What True Position does:
- *Allows* interchangeability without use of small tolerances
- *Provides* more area for location of hole center
- *Speeds* determination of tolerances
- *Simplifies* tolerancing of complex parts
- *Overcomes* accumulation of tolerances
- *Gives* more adequate location
- *Interprets* tolerances for both production and inspection
- *Permits* use of easily made gages that simulate mating part
- *Reduces* scrap caused by other tolerancing methods

LIKE ANYTHING ELSE, True Position Tolerancing requires the confidence of the user if its use is to be successful. This is especially true if a complete program is to be instigated. We've simplified this series as far as we could to keep in the complete understanding of the basic (TP) concept.

This "last of a series" deals with non-circular features to which the principles from earlier parts of the series apply. The only difference is that for circular features the tolerance zones are circular, where as here they are areas defined by two parallel lines.

In Fig. 1 two slots are being checked. The tang of the gage is shown entering the slot in both cases so they check out for function. This is to say part centerlines fall within their allowable tolerance zones. In the top view, the slot in the part is theoretically in "perfect" position since its centerline and the centerline of the gage tang are in coincidence. As long as the slot is at MMC,* right on the money, its centerline would still be in the tolerance zone, even if the slot shifted either way. This would be so provided the shift weren't greater than the allowable positional tolerance.

In the lower view, the part slot has shifted the amount allowed according to (TP) specifications in relation to some orientation point or surface, and is now resting against the side of gage tang. Here again, if everything is "perfect" (the slot right on its high limit) the centerlines of the slot will lie right on the outermost edge of the increased tolerance

*MMC stands for maximum material condition. For a male part it's the largest size, and for a female part it's the smallest size. Remember, (TP) refers to the theoretic center of a feature.

Last of a series dealing with positional tolerances that may be applied to features other than cylindrical, such as keyways.

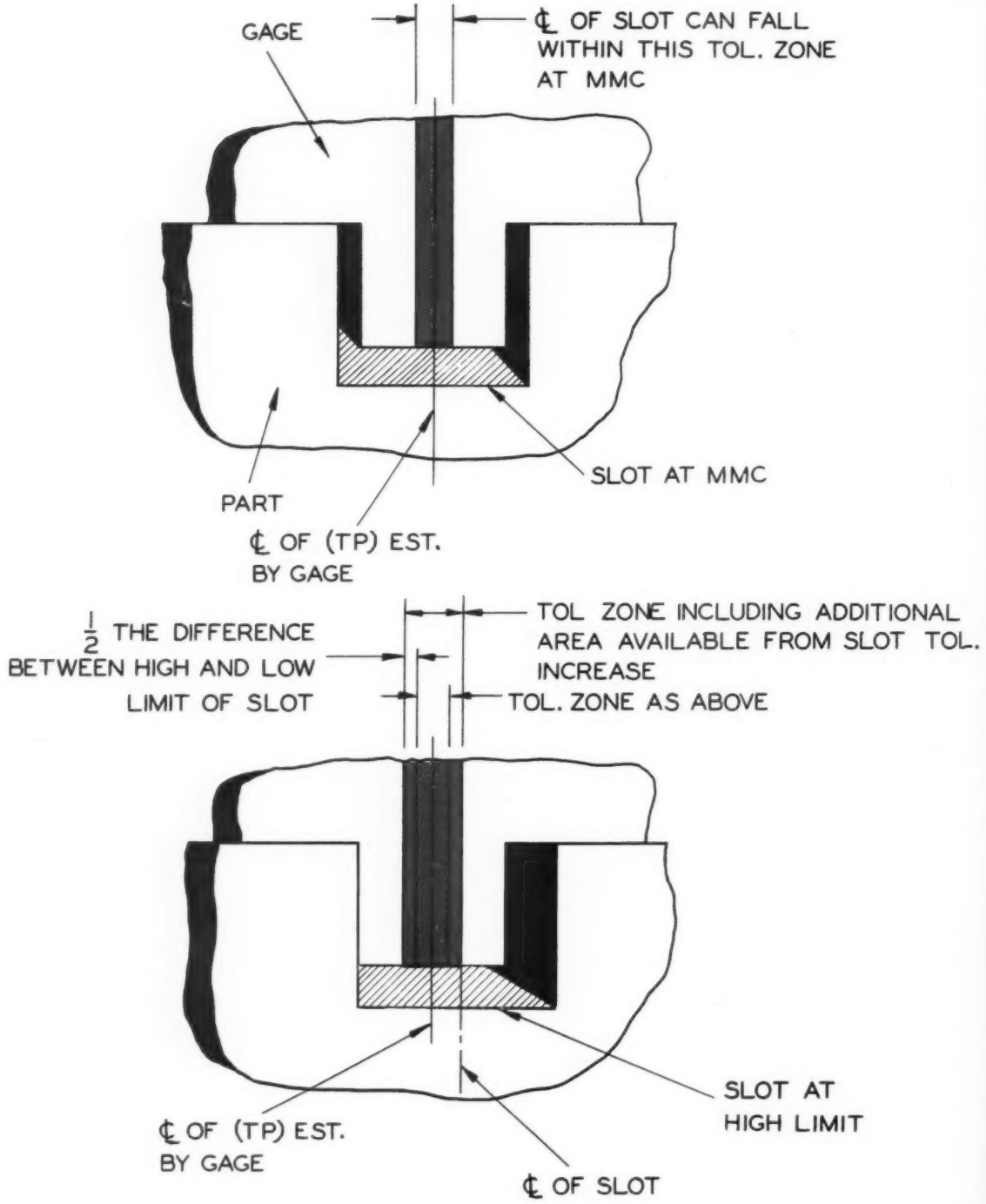

GAGE
℄ OF SLOT CAN FALL WITHIN THIS TOL. ZONE AT MMC
SLOT AT MMC
PART
℄ OF (TP) EST. BY GAGE
½ THE DIFFERENCE BETWEEN HIGH AND LOW LIMIT OF SLOT
TOL ZONE INCLUDING ADDITIONAL AREA AVAILABLE FROM SLOT TOL. INCREASE
TOL. ZONE AS ABOVE
SLOT AT HIGH LIMIT
℄ OF (TP) EST. BY GAGE
℄ OF SLOT

Fig. 1 These are only partial views of part and gage being used to check the part. In the upper view a perfect condition exists between the gage tang and the part slot—the two theoretic centerlines are in coincidence. In the lower view the part slot has shifted its limit and still "checks out."

zone.

The increase in the tolerance zone here is due to the slot size being at its high limit. To obtain the additional tolerance area on both sides of the tolerance zone (established by (TP) specs), take the difference in slot size at MMC from largest size and divide by 2. This amount can then be added to both sides of the positional tolerance zone.

If two mating parts having several odd shaped features are to be given (TP) specifications, the same reasoning and approach will do the trick. The parts shown in Fig. 2 are to be used together, or function one inside the other. In this instance they are to be considered "fixed" fasteners, since no third member is used with them. You will remember the "fixed" fastener approach was applied when a part with studs, for instance, accepted a part with clearance holes.

The female part requires a (TP) specification limiting the position of its four keyways. The male mating part requires the same, limiting its keys. These can both be determined by the same simple arithmetic. As shown in Fig. 2 the MMC size of the key of one part is subtracted from the MMC size of the keyway of the other. The remainder is then divided by four to establish the true position locational specification.

In Fig. 3 we see how gage dimensions to check the configurations of Fig. 2 are even easier to establish. Gages require only size specifications, since gage tolerance will normally be applied in the proper directions with the usual tendency toward "absolute" accuracy.

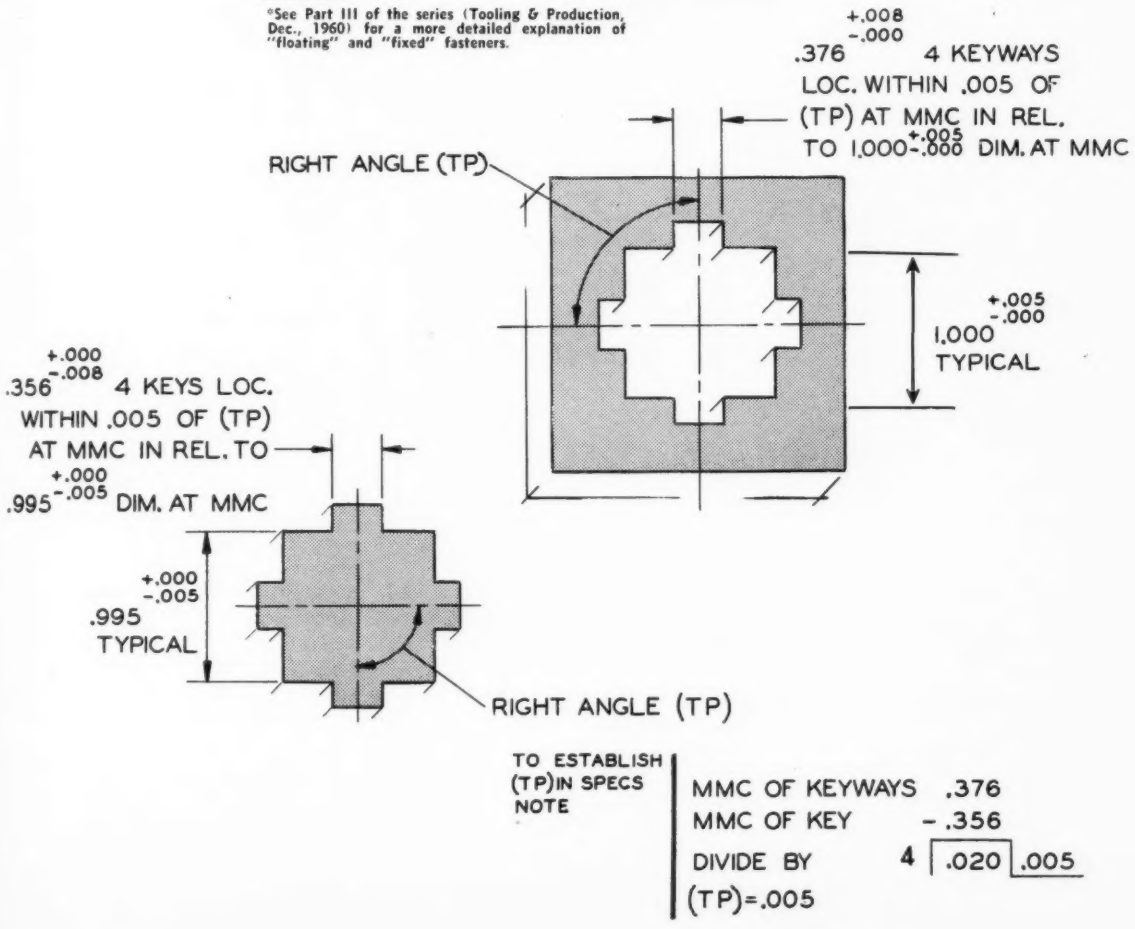
For the female gage, which must accommodate the largest key when as far out of position as the (TP) tolerance specification allows, the MMC size of the key plus twice the positional tolerance will give the slot size.

For the male gage, which must accommodate the smallest keyway when as far out of position as permissible, the MMC size of the keyway minus twice the positional tolerance will give the tang size.

Confusion concerning the .995 dimension and the 1.000 dimension can be cleared up in this way. Remember the true position

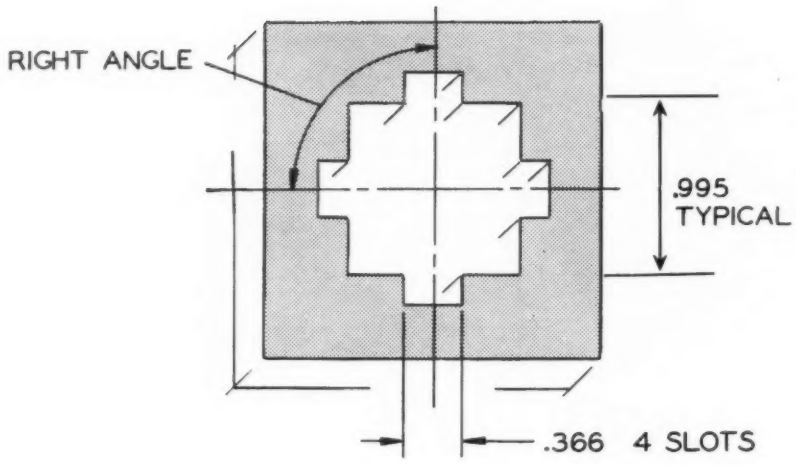
Fig. 2 The female part above, and the male part at lower left are considered "fixed fasteners" and require the "subtract and divide by four"* approach to establish the tolerance variation allowance from (TP). They are dimensioned to be used together.

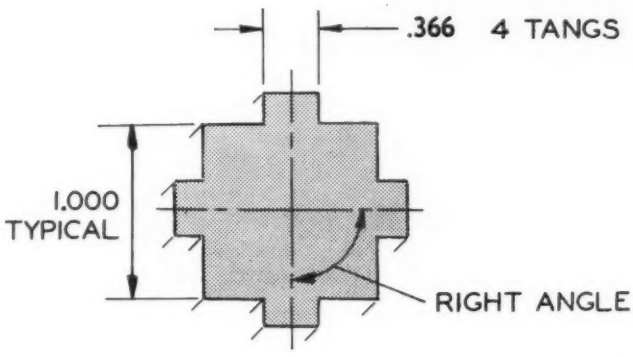
*See Part III of the series (Tooling & Production, Dec., 1960) for a more detailed explanation of "floating" and "fixed" fasteners.



TO ESTABLISH (TP) IN SPECS NOTE

MMC OF KEYWAYS .376
MMC OF KEY − .356
DIVIDE BY 4 | .020 | .005
(TP)=.005





TO ESTABLISH GAGE SIZES		
	MMC OF KEY .356	MMC OF KEYWAY .376
	2 X POS. TOL. +.010	2 X POS TOL −.010
	.366	.366
	SIZE = .366	SIZE = .366
	FEMALE	MALE

Fig. 3 These represent gages intended to check functionally parts in Fig. 2. They are dimensioned according to the simple procedure shown. If the parts check out according to these gages, they will function together.

tolerancing of the part keys and keyways is in reference to theoretic centerlines through these dimensions.

If it were not for the fact that a metal to metal fit is often undesirable, the .995 dimension could have been 1.000 with its same tolerance. Or, on the other hand, there could have been a greater difference in the two dimensions. It is the true positions of the keyways and keys with which we are primarily concerned.

Other dimensions not given are understood to be in the direction of no interference.

This very fundamental treatment of gages isn't the whole gage story. It should, however, point up the fact that TRUE POSITION TOLERANCING CAN BE QUICK AND SIMPLE AND WILL PROVIDE ALL THE ADVANTAGES SET FORTH.

This series has been very popular, and since requests have been for the whole series (even before it was completely published) we are not sending out individual parts. This installment completes the series. Requests for the complete set will be honored while copies last.

"How can I prove my machine replacement needs?"

Machine Replacement For The Shop Manager

by Baxter T. Fullerton

Chapter I - What's Wrong With Replacement Formulas?

SOMETHING IS WRONG with machine tool replacement formulas. All over this country, shopmen are tearing their collective hair because the calculations won't "prove out" machines that they **know** should be replaced. In many operating men's judgment, these highly publicized and increasingly used tools of modern scientific management are just not yielding the right answers. Unfortunately, the people making the final "buy" or "not buy" decisions are not aware that they are often acting on wrong information. The fact that an answer can be expressed mathematically too often deludes us into assuming that the answer is right!

Replacement Can Be Profitable

The fault does not lie primarily with the formulas themselves, but rather with the way we have been using them. The formulas contribute to their own misuse, however, because the calculations have always been such a mystery to the large majority of us. At best, all that most of us know is that we put some information on a form, read some charts and out comes an answer. How the answer was arrived at we don't know and, therefore, we haven't the means to judge whether the answer is right or not. Replacement formulas, on the other hand, **have** stimulated replacement thinking, and this is good. People are talking about replacement, and thinking about it, and at least are aware that machine tools can be replaced at a profit. The big job now remains to show what this profit really is.

There are three main problems to be overcome in the proper use of formulas. The first, and by far

Baxter T. Fullerton is Director of Marketing Services, The Warner & Swasey Company, Cleveland, Ohio. No stranger to Tooling & Production readers, he authored "What's A Man-Hour Worth?" which appeared in September 1959. His college degree in economics was followed by extensive training in machine tool manufacture, service, and sales. He is no theoretician, referring to himself as "trained in machine tools with a background in economics." Experienced in the financial securities field, he looks upon general purpose machine tools as the "government bonds of your machine shop." Particularly has Mr. Fullerton's work with machine tool users given him an appreciation of the need for dispelling the fog surrounding many aspects of replacement economics. His articles, starting in this issue, are devoted to that purpose.

the most important, is that we are completely understating the case for replacement by betting all our money on the overused word **obsolescence** and forgetting about **deterioration** — the fact that machine tools wear out. Secondly, most replacement justifications are worked out too tediously and too accurately. The information going into them is not that accurate. Third, in spite of admonitions to the contrary, they are not being used with judgment, mostly because nobody seems to be completely clear on where and in what manner judgment is to be used.

Obsolescence and Deterioration

More on the second and third points later. The main problem stems from a lack of proper understanding of the relative importance of **obsolescence** and **deterioration** in the life of a machine tool. Let's take a close look at these words.

We replace machines for a combination of two reasons:

1) The old machine has become **obsolete.** A machine of improved design has become available that can do the work better or faster than the old machine could, even when it was brand new.

2) The old machine is worn out. It has gone downhill in relation to itself when it was new. It has **deteriorated.**

These two factors are present, in some degree, in every replacement calculation.

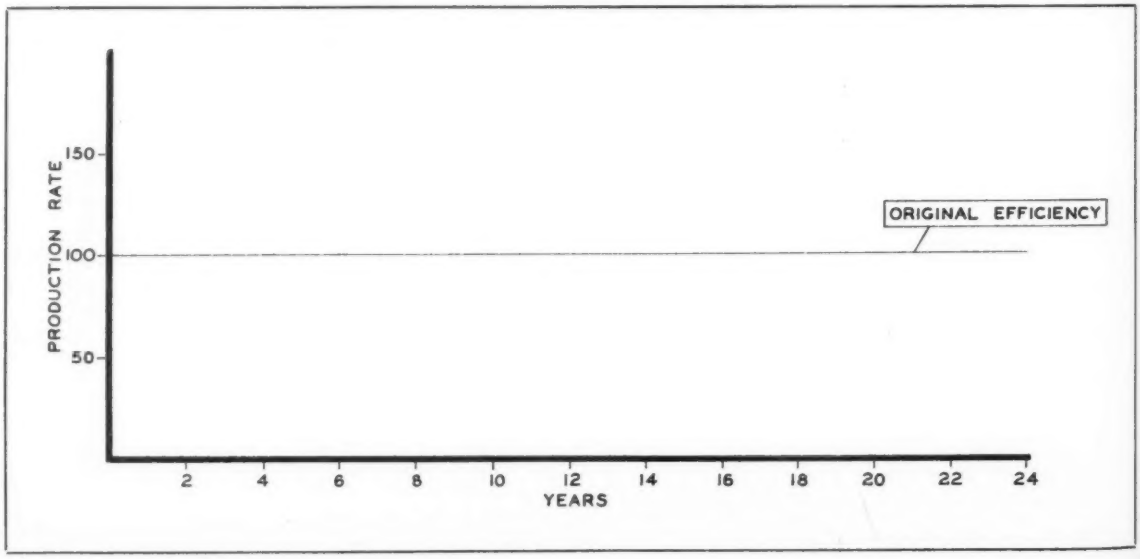
Deterioration

What happens can be shown graphically. Let's start with a brand new machine tool and call its productivity 100. If the new machine were capable of operating at its original efficiency throughout its entire life, we could show that condition by Fig. 1.

What actually happens, of course, is that from the day it's first installed the machine begins to go downhill in **relation to itself** —it starts wearing out. This is a gradual process in most cases, but by the end of any real length of time it has deteriorated a noticeable amount.

Fig. 2 shows a case in which the new machine at the end of 10 yrs is capable of working at only 80% efficiency rather than 100, and at the end of 15 yrs at only 60% efficiency. It has **deteri-**

Fig. 1 Production rate of a machine that never wears out.



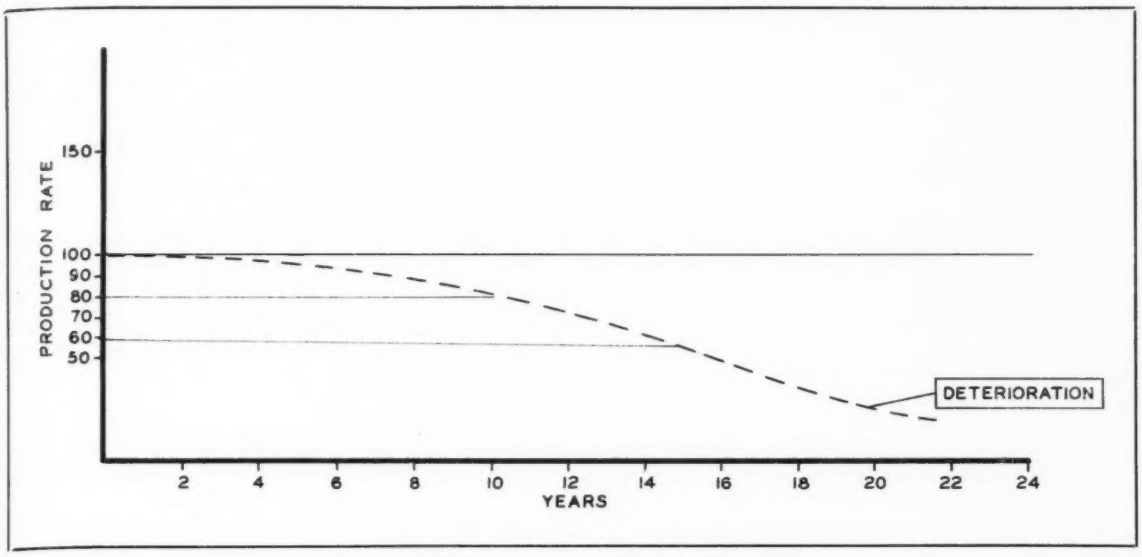


Fig. 2 Production rate of a deteriorating machine.

orated to this extent.

Obsolescence

While this is going on something else happens. From the first day that the new machine is installed, some better machine may become available for purchase. This improved design can be charted by showing the ability of the better machine to operate at greater than 100% efficiency compared to the new machine we are now installing. These future design improvements won't come evenly — they'll come in fits and starts as shown in Fig. 3.

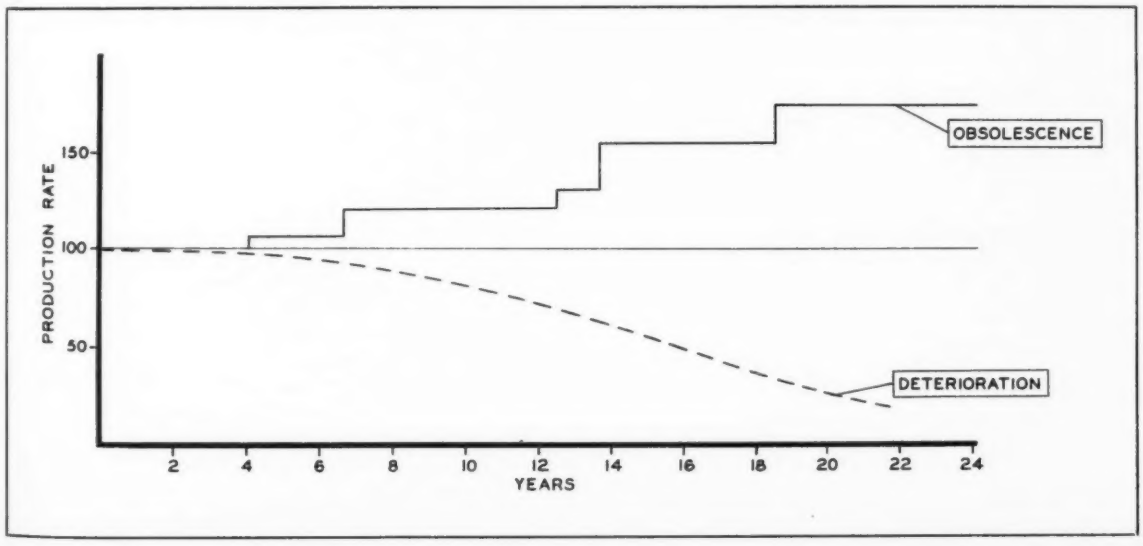
The exact shape of these steps of design improvement, however, can only be a matter of history. Looking into the future, we don't know exactly what they'll look like, so we'll start out by drawing a smooth line, Fig. 4, showing only that obsolescence will take place.

We're not concerned yet about the shape of these two curves. We're concerned only with the fact that both obsolescence and deterioration do happen to a machine and that they are distinct from each other.

A Measure of Increased Productivity

If at any time during the life of a machine tool we can determine how far downhill it has gone in relation to itself—how much it has deteriorated—and if we can also determine how much more productive a new machine would be than our present one was **when it was brand new,** we can then add these two amounts, and measure how much totally more pro-

Fig. 3 Production rate of machines of better design as they become available.



ductive the new machine will be.

In Fig. 5, for instance, point A is the production rate of a machine that has been used (deteriorated) for 10 yrs. Point B is the production rate of a new machine that might take its place. The distance between A and B represents the total productive advantage of the new machine over the old.

To carry this reasoning forward to its final step—if we buy the new machine at this point, (10 yrs), we then have a new horizontal line, based on the inherent increased productivity of the new machine. The new machine, in its turn, begins deteriorating and accumulating obsolescence, as depicted in Fig. 6.

It will be obvious to operating people that in many situations deterioration is equal to, or of greater importance than, obsolescence in a replacement calculation, but in our use of replacement formulas to date, we have not been giving deterioration its proper due. In one group of 90 calculations from widely scattered shops, less than 10% of the "savings" on the average came from scrap, maintenance and downtime, which have been the only widely used measurements of deterioration. In MAPI's **Business Investment Policy**, another sample showed that 80% of the savings came from obsolescence. For some types of machine tools, if I had to use an 80% figure, I would say that the reason for replacement is 80% deterioration and 20% obsolescence!

Wanted: A Yardstick for Deterioration

I think that, unknowingly, we in the industry, along with the metalworking magazines and other interested parties, have been guilty of overselling "modernization" to the point that we forget to question whether we have a proper measure for deterioration. The increased productivity in the design of new machines is important, of course. Many times, a measurement of the savings from this increased productivity is more than enough to "prove in" a new machine.

It's perfectly natural, besides, that the machine tool companies should put their best foot forward and stress increased production. But as a result we tend to forget that the old machines have gone downhill, and that this measurement belongs in calculations as well. Admittedly, the effect of deterioration is difficult to measure, but we must make some attempt to measure it as best we can because it has an effect on machines far greater than the present users of formulas are measuring.

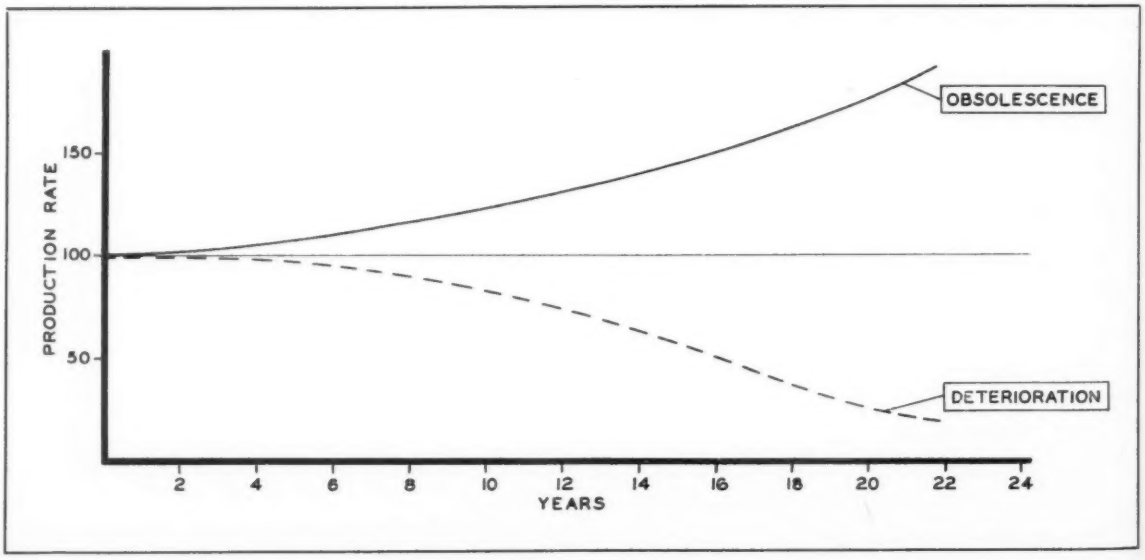
A plant engineer told me recently that the only new machines he had been able to buy in the last five years were machines on which he was able to show savings because of a methods change. In the meantime he was still operating a 24-yr-old turret lathe because he was not able to define the effects of age on that machine in terms his financial men would understand. We need to find better ways of measuring deterioration.

Formulas Need Simplifying

The second problem in connection with the present use of formulas is a corollary to the one we have just discussed. Formulas today are being worked out too accurately and in too much detail. They tend to become too tedious and too expensive to prepare and to use. Often it requires several days or even weeks of a man's time to work out a replacement story on one machine.

Besides being too expensive to use, accurately worked out replacement calculations run the danger of being believed too literally. If you have only approximate figures in any part of a calculation, your answer can't be better than approximate, and it certainly does

Fig. 4 Production rate of better machines as we look into the future.



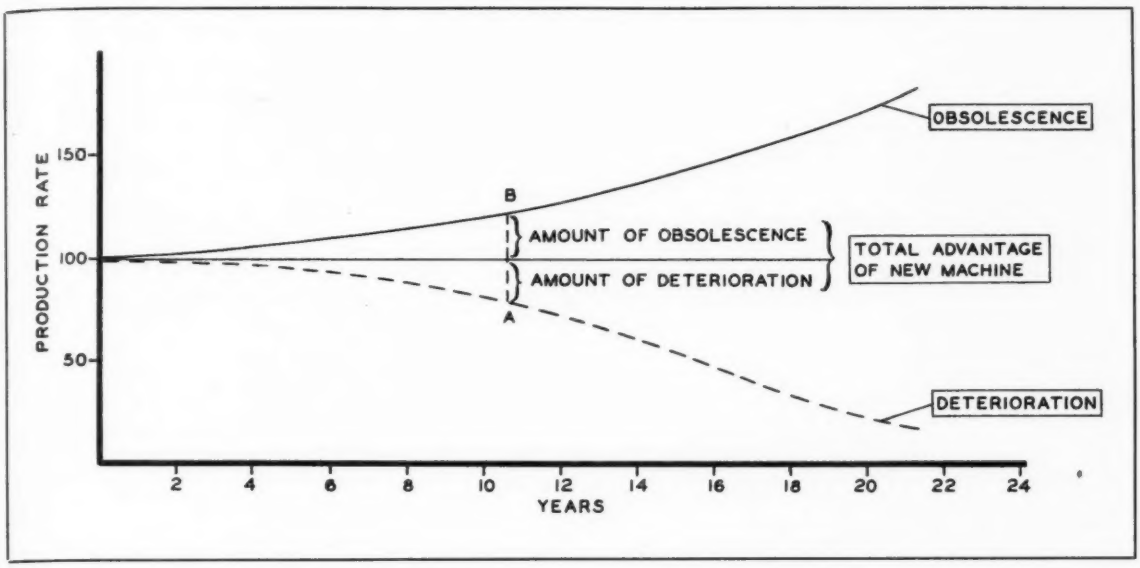


Fig. 5 Measurement of difference between old machine and new machine at 10 yrs. Point A represents production rate of old machine. Point B represents production rate of new machine.

not make any sense to carry the answer out to the third decimal place. We're dealing in very round figures, and we'd be much better off if we'd admit it.

Theoretically, it is correct to put down all types of savings, even those savings which may be only a few dollars/yr. But when you've gone to considerable effort to arrive at a figure that may be $187.50, you're not in a very good frame of mind to remember that your final answer may be off by several thousand dollars because you cannot estimate certain values accurately.

The Judgment Factor

This leads to the third problem in the present day use of formulas and that is that they are **not,** in my opinion, being used with judgment. All of the many books and articles on this subject stress the point, **above all remember to use judgment.** This is good. I couldn't agree more wholeheartedly. The trouble is that these writings, by and large, don't tell us where to use judgment, how to use judgment, or what the effects of that judgment might be. I suspect that sometimes we're only paying lip service to judgment anyway, because many corporate adaptations of formulas being used today seem to be quite proud of the fact that the shopmen are only able to show savings that they can "prove." The admonitions to use judgment on one hand, but only show savings that can be "proven" on the other hand, contradict each other. The operating man who is using the equipment in question is the one man whose judgment should be sought, and if we're not willing to take his judgment on certain matters, we often end up working with meaningless figures. What we need are better ways to express these judgments in dollars and cents.

An Approach to the Right Answers

If the answers presently being obtained from the use of formulas are as far wrong in many cases as all of this implies, the argument can be advanced that we should go back to the use of pure judgment in replacing machine tools, and forget about the calculations. Perhaps we should, but I don't think we will. The use of some sort of economic justification for the purchase of replacement machine tools is with us to stay, and is becoming more common, especially in large multi-plant companies.

Our job, then, is to learn how to use replacement formulas intelligently and in proper perspective, whether they are sophisticated formulas that have several pages to fill out, or whether they are merely a back-of-an-old-envelope calculation.

This is the first of a series of articles devoted to this purpose. I hope that they will help shop people and financial people alike in finding better answers to these problems that have been plaguing us, and that they will help bridge what is now a rather large gap in understanding between these two phases of the business.

The next four chapters will deal with the proper use of replacement formulas or calculations, no matter what your current method or formula. They will assume that you now have a systematic approach, and I hope that they will enable you to make better use of your present system. Many companies seem to have worked out their own adaptations of either the MAPI **Business Investment Policy** formula, or the cash discount or cash flow method. There isn't a great deal of difference in the answers obtained by any of these methods, and since the use of the answers is only relative, the choice of methods is not nearly

as important as the correct use of the method once it has been chosen.

Chapter II and III will discuss how to measure the production improvement that can be obtained from replacement machine tools. In order to measure correctly the effect of both obsolescence and deterioration, it is necessary to measure them separately. Some of the simple calculations are easier if the effects of obsolescence are measured first. Thus, Chapter II will deal with the measurement of the effects of obsolescence. Chapter III will discuss measuring the effects of deterioration. It is here that the present use of formulas falls down most heavily.

Once you have measured as best you can the amount of annual production improvement to be obtained from a machine tool investment, it is necessary to use proper judgment in applying this figure to your calculation. Chapter IV will discuss putting a proper dollar sign on hourly savings, and will also discuss the estimating of the service life for the new machine or machines. The length of time that you expect your investment to be operating profitably has a bearing on the selection, and in my opinion proper judgment has not always been used in selecting "service lives." There are some simple rules of thumb here that will be helpful.

When the formula or calculation has been worked out, there still remains the problem of interpreting the answers into a proper course of action. Conventional use of replacement formulas indicates the purchase of the investment showing the greatest "return." This approach fails to recognize that there are different degrees of risk involved in different machine shop investments, just as there are in stock and bond investments. Chapter V will show that general purpose machine tools are the "government bonds" of your machine shop, and should be purchased at a lower comparative return accordingly.

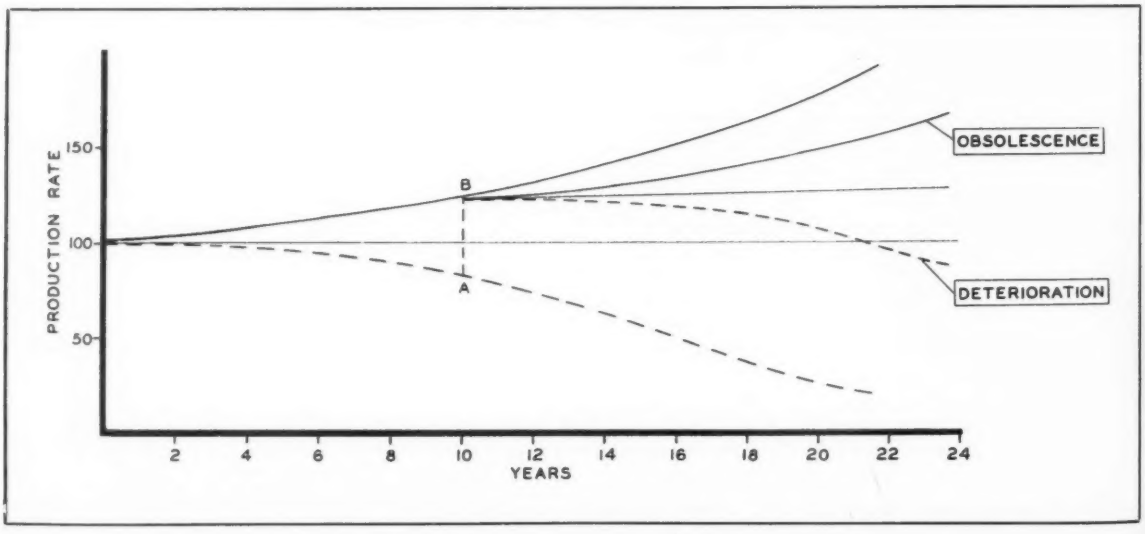
If you're not satisfied with your present replacement justification method; if you think it's too complicated or too obscure; if you want to compare it with another method; Chapter VI through VIII will discuss a new type of replacement calculation, based not on a formula but on an empirical look at what actually happens to a machine tool over its lifetime. This method defines machine tools as investments, and compares them with other investments. The final calculations required are exceedingly simple.

I wish I could say that the explanation of it will be simple but, unfortunately, we are not dealing with a simple subject. I have tried however, to work the method out in shopmen's terms, and in relation to shopmen's experiences, because the success of any formal method of justifying machine tool replacement must stem from correct information at the shop level. For this purpose there should be correct understanding at the shop level of all aspects of the calculation. The three chapters devoted to this subject will unfortunately have to deal, to some extent, with depreciation, taxes and even that old bugaboo "the time value of money." But out of all of it will come, I hope, a better understanding of the subject.

It may be fair to say that the capital goods industry, sellers and buyers alike, has a bear by the tail in replacement formulas. A good deal of excellent work has been done, but for many the end result has been disillusioning. The time has come to take a new look at the whole problem, to put it in its proper perspective, and, where some sort of a formal approach does seem to be indicated, to make such an approach a useful tool that will as nearly as possible give the right answers.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Road, Cleveland 18.

Fig. 6 Future obsolescence and deterioration of new machine we buy.



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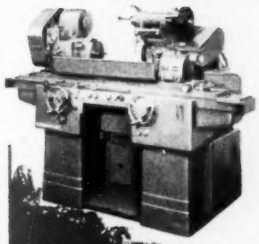

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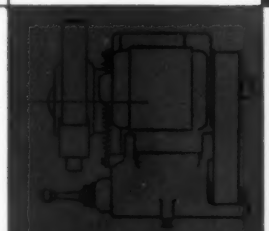

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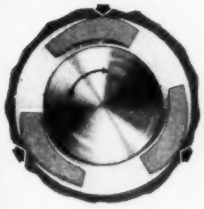

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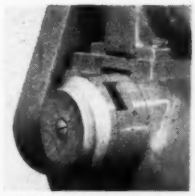

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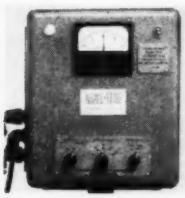

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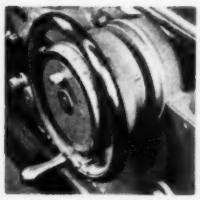

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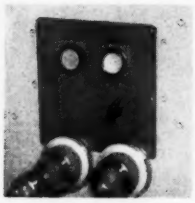

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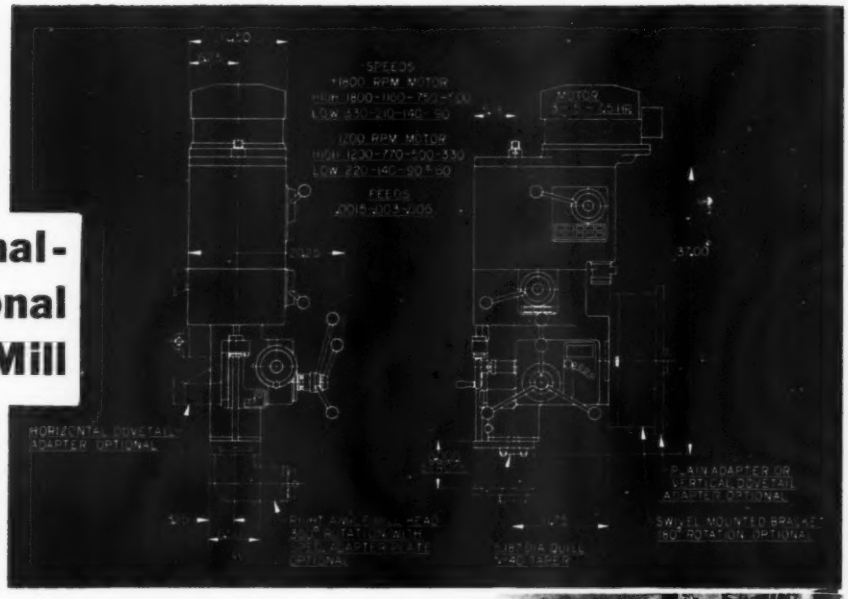

Fig. 1 Conventional milling operation using manual feed and with duplicator disengaged.

Here is a versatile machine that has some unusual features. It can be used as a conventional mill as seen in Fig. 1, or for other performance as shown in Fig. 2 through Fig. 5.

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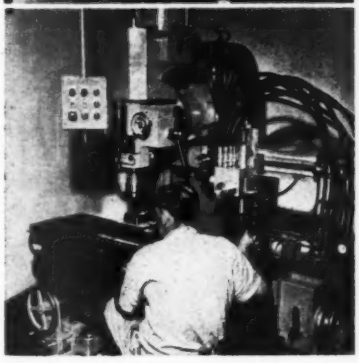


Fig. 2 Die duplication with infinite manual or automatic contour control.

Fig. 3 Duplicating with automatic contour control.

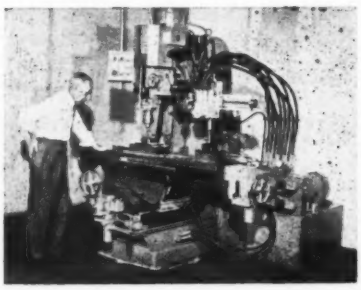


Fig. 4 Heavy duty drilling with table tilted.

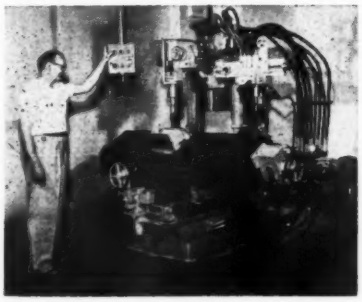
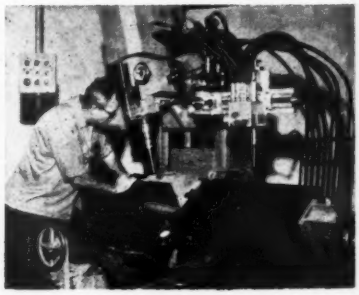
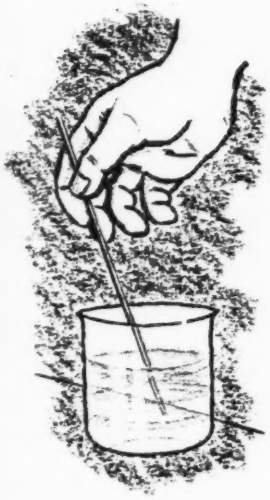


Fig. 5 Compound angle boring—using jig boring standards. Head and table of the Visi-Trol 3-D Bed-Type Mill can be tilted 45° either way from center.





Trouble Shooting With

Mixed Cutting Oils

IN SOLVING A TOOL LIFE or finish problem on a cutting operation a plant has several approaches it can try. One real cost and time saver is a system used at Giddings & Lewis in appropriate cases.

The Fond du Lac, Wisconsin, manufacturer of machine tools makes a practice of first checking the variables that are easiest and least expensive to alter or change.

First they check the tool setup. If this is right, they test the metal being machined for variations in hardness or specifications. If this is up to standard, they then check the lubricant that is being used in the operation.

The company's engineers find that these three checks usually solve a problem and save the time and expense of going into costly investigations of tool design or process modification.

Here is how Giddings and Lewis, in one case, found through their checking program that a "trouble shooting" extreme-pressure base oil compound would solve the problem confronting them.

In thread milling a worm they ran into a problem of low cutter life. They were only getting one to two parts/cutter grind using a high speed steel 4″ dia staggered tooth thread mill with 18 teeth and 7° side clearance. They were milling a ½″ circular pitch worm on a 3″ dia shaft to a depth of 0.343″ with a linear length of 3½″. The metal was nitralloy 135, modified by heat treatment to 28 to 32 Rockwell C. The cutter speed was 113 rpm with a circular feed of 5.63 ipm.

In the checkup program, the tool setup was found to be okay. The metal showed no apparent defects or hard spots, so Giddings and Lewis engineers checked into the lubricant.

To save time in the lubricant checkup, they first added a special base oil — Vantrol 5510-Z*. Ten gallons of the 5510-Z was mixed with 50 gal of regular cutting oil.

Immediately and without any other changes they obtained 15 pcs/cutter grind, compared to one or two pcs obtained previously. In this case. they discovered that they needed greater chemical activity in their cutting oil.

A trouble shooting compound is a base lubricant that provides a high degree of chemical activity to increase the extreme-pressure lubrication of regular cutting oils. Giddings & Lewis used a base oil that combined six different chemical additives that are completely safe and provide effective chemical lubrication. This base is added to other cutting oils. On operations where chip welding occurs, such as in tapping, threading, or broaching, it frequently can be used straight.

This trouble shooting base oil approach has also been used when metals run slightly out of specification and create tool life and finish problems. When this happens, the addition of the 5510-Z takes the operation out of the trouble zone.

Since many of these problems are transitory in nature, working with a trouble shooting base lubricant can be an effective step to greater economy.

If the quick, 3-step check does not improve finish or tool life, then the plant must return to the more costly and time consuming check of tool design and other aspects of process modification to obtain an answer to its problem.

end

*Van Straaten Chemical Company, Chicago, Illinois

Tool & Die Makers Add "Precision Machining"

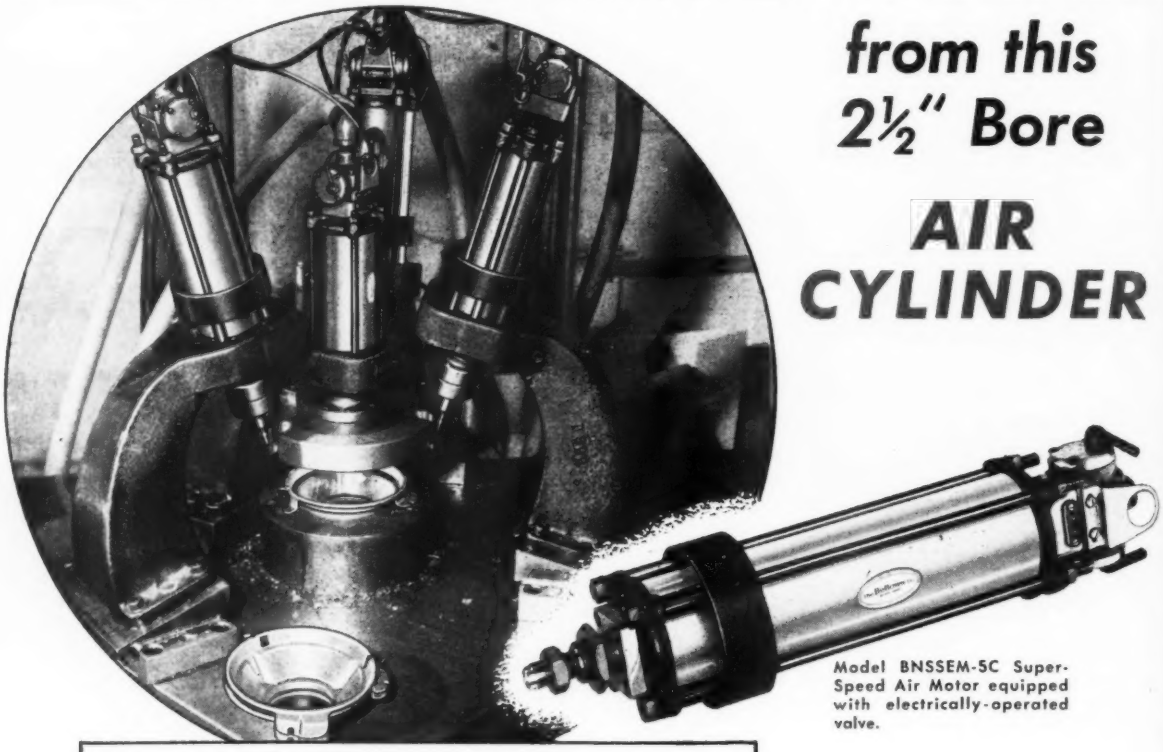
From the time Solomon singled them out when he dedicated the Temple in Biblical days, tool and die makers have been among industry's proudest craftsmen. That's why the biggest news at the 1960 Annual Convention of the National Tool & Die Manufacturers Association was the decision to change the name to National Tool, Die & Precision Machining Association.

Behind those two words, "Precision Machining," lay many months of soul-searching among the 1000 companies in the organization. It began with the first Sputnik and has intensified as every new satellite and missile reached the launching pads.

Tool-and-diemaking is traditionally the keystone of mass-production of metal and plastic products. Until the dawn of the Space Age, it served the same role for ordinance. However, with the shift in recent years from emphasis on conventional military weapons, particularly manned aircraft, to missiles and rockets, mass-production of defense hardware by dies, jigs and fixtures has been largely replaced by requirements for shorter runs of more highly precise components.

SUPER-SPEED·SUPER-POWER

from this 2½" Bore AIR CYLINDER



Model BNSSEM-5C Super-Speed Air Motor equipped with electrically-operated valve.

This special machine designed and built in the plant of Electro-Mechanical Products Co., clamps and pierces 3 holes in 20,000 pieces per day. It uses 3 Bellows Super-Speed Air Cylinders and a Bellows Air Motor. Set-up cost ⅓ the price of a punch press die.

This Super-Speed® Bellows Air Motor® is so powerful it can drive a 1/2" hole through 1/16" thick steel. The piston rod moves at a speed six to ten times the speed of an equivalent sized air cylinder.

That's why the Super-Speed is an ideal answer to many piercing, staking, forming, riveting, stamping, swedging and similar operations.

The Super-Speed Air Motor uses the basic Bellows integral valving system with built-in operating and speed controls. Only one air connection is required which can be flexible hose. The directional valve may be either the low-voltage (8-12V) Electro-aire® Valve or the finger tip control manual valve. One bore size, 2-1/2". Four standard stroke lengths, 4", 6", 9" and 12".

Write for Bulletin SS-5R. Address Dept. TP-161, Bellows-Valvair, Akron 9, Ohio.

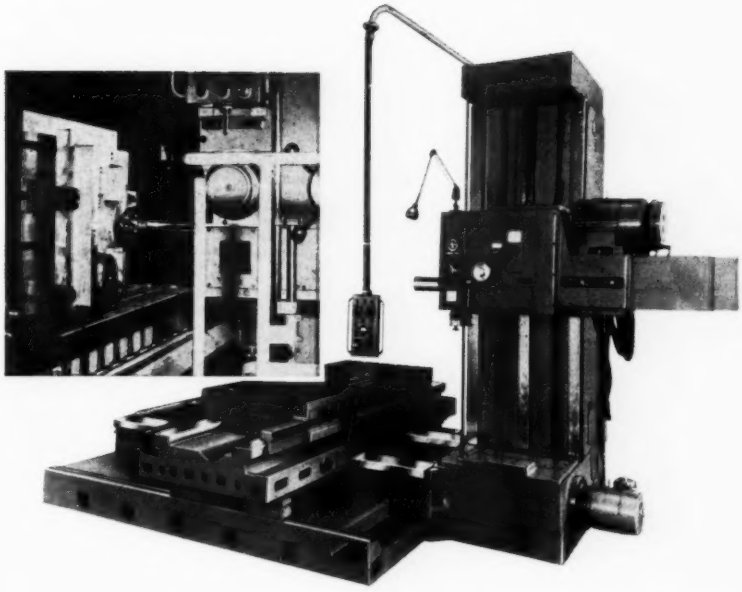
More than 200 Bellows-Valvair Field Engineers are at your service

Bellows-Valvair
AKRON 9, OHIO
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

965-C

CIRCLE INFORM-A-GRAM KEY NO. 72

Numeripoint Control Uses Dial Or Tape

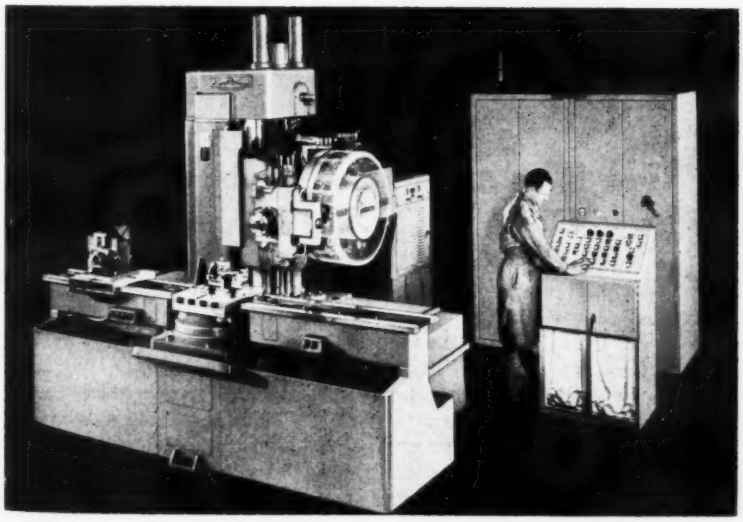


Complete pendant control of all machine functions, "joystick" control of milling feeds, a three-way column, and a motorized headstock are among the features of a Giddings & Lewis 5″ spindle table-type horizontal boring, drilling, and milling machine. Numeripoint control automatically locates the machine, using tape or dial input. Speeds and feeds can be selected by tape, and automatic drilling, milling, tapping, and boring functions are also available.

Independent saddle and spindle feeds, as well as combination saddle and spindle feed for smooth uninterrupted machining of long bores, are provided. Head, table, and saddle milling feeds can be operated independently or in any combination. The "joystick" directional control moves head and table independently or simultaneously in the direction in which the stick is pointed.

The machine is designed to operate under all automatic control systems, including Giddings & Lewis Numeripath or Numeripoint punched paper tape and magnetic tape controls.

Tape Controlled Machine Shop



Pictured here is the Milwaukee-Matic Model II, a self-contained machine shop that is completely numerically controlled, employing a standard 1″ wide, 8-channel punched tape. The control console (right) contains the auxiliary controls and the tape reader. This "machining center" will mill, drill, bore, ream, tap, select and change its own tools, feeds and speeds, and transfer the workpiece. Models are available with either a rotary table or an 8-position index table. The Milwaukee-Matic concept provides for a wide variety of simple or complex machining operations on a given workpiece with a single setup in most instances. All machine motions are powered by a 30 hp hydraulic unit. Accurate positioning for the most demanding tolerances is accomplished through an electro-hydraulic system controlled by electrical feedback. Speed ranges are from 0-4000 rpm in increments of 10 rpm. The feed range is from 2-99 ipm in increments of 2 ipm, with a rapid traverse rate of 200 ipm. The three axis of motion, X-longitudinal, Y-vertical, and Z-depth, respectively have ranges of 24″, 20″ and 16″. For details circle Inform-A-Gram No. D3.

Everett M. Hicks

Machine Tool Builders Meet . . . elect 1961 officers

Francis J. Trecker

Wallace E. Carroll

Lawrence C. Gleason

Grayson M. Stickell

Bruce F. Olson

Ludlow King

Everett M. Hicks, vice president and general manager, grinding machine division, the Norton Co., Worcester, Mass., was elected president of the National Machine Tool Builders' Assn. at its 59th Annual Meeting at The Homestead, Hot Springs, Va.

Francis J. Trecker, president of the Kearney & Trecker Corp., Milwaukee, Wis., was elected first vice president, and Wallace E. Carroll, president of the American Gage & Machine Co., Chicago, Ill., was elected second vice president. Lawrence C. Gleason, president and general manager of Gleason Works, Rochester, N.Y., was elected treasurer, and Grayson M. Stickell, president and general manager of Landis Machine Co., Waynesboro, Pa., was re-elected secretary.

New directors elected were Mr. Carroll, Mr Gleason, and Mr. Bruce F. Olson, president of the Sundstrand Corp., Rockford, Ill.

Ludlow King was re-elected executive vice president of the Association.

Machine Tool Builder Looks At Automation

MACHINE TOOL BUILDERS, while developing the equipment that makes automated factories possible, have at the same time been spurred by the machine users' needs for increased capacity. This mushrooming effect and other aspects of automation were discussed recently by Alan C. Mattison, president of the Mattison Machine Works, Rockford, Ill., and immediate past president of the National Machine Tool Builders' Assn. He represented the Association at a special hearing before the Subcommittee on Automation and Energy Resources of the Joint Economic Committee of Congress.* In 1960, the Committee invited spokesmen from government, industry, labor, and finance, who had testified at the original hearings on automation in 1955, to present their current views on the progress of automation.

In one phase of his testimony to the Committee, Mr. Mattison said,

*New Views On Automation, Joint Economic Committee, Congress of the United States, U. S. Government Printing Office, Washington, D. C., 1960

"The new machine tools are being built to perform operations in sequence, with loading and unloading—the shift of work from one operation to the next—completely automatic. Another development is the inclusion of automatic assembly as a part of the processing sequence. Accuracy in many cases is now assured by completely automatic checking and gaging at successive stations."

He continued, "A further trend in machine tool automation is toward starting directly with a rough part rather than as in the past with one which has had to be preconditioned by another machine.

"I think the advantages of these innovations are apparent. Amazing advances have been made possible in accuracy. Millionths-of-an-inch are now getting to be as common as ten-thousandths used to be. With today's controls, no longer are rate of output and accuracy of performance dependent upon the human operator. These factors are built into the machine itself. Quality of work becomes a known factor. Output per hour, in terms of workpieces machined, becomes a known factor. Costs are thereby accurately determinable. And last, but hardly least, output per man-hour is remarkably increased.

Throwaway Plow Shares

"We have been talking about automation in very general terms. Let me give you a concrete example from Mattison's own experience.

"In the old days, when a farmer's mule or horsedrawn plow became dull he had it 'resharpened' by a skilled metalsmith. Today, that same farmer's plow is probably one of the high-speed light-draft bottoms, with a share that offers 'razor blade' convenience of replacement and throwaway economy. When the share gets dull the farmer simply removes three or four bolts and replaces it. His capital investment is more productive, and cost of replacement—all things considered—is much lower than the cost of reconditioning an old-fashioned share.

"When the idea of throwaway shares gained acceptance, John Deere turned to automation to double their capacity to meet the snowballing demand. Now this new share bears little resemblance to some of its ancestors. It is a precision cutting tool, geometrically and metallurgically well formed.

Automatic Grinding

"A new type of grinder was needed, a machine that could take parts right from a conveyor; locate and clamp them automatically; finish the bevel from the end position in a single, straight pass; maintain rigid tolerances, unclamp the share; and unload itself—depositing the finished shares on a conveyor leading to the next operation." Mattison Machine Works designed the needed grinder.

Mr. Mattison continued, "It would take at least two conventional automatic center-column machines and two operators to match this grinding production of one new automated grinder.

"The grinding operation is just one of the many continuously performed in the new automated line. Operations include cutoff, forging, blanking, piercing, heat treating, quenching, drawing, roll forming, surface grinding, shot peening, painting, and packing. . . . Only two inspectors service this entire line, from forging to packaging, and the line operates at 85% efficiency.

"This single automated line produces all sizes of shares, from 14 to 22″ at the rate of 720/hr."

Mr. Mattison pointed out that in 1960 the company's estimated production of plow shares was one million, twice as many as could be produced under the old manufacturing method.

Progress In Automation

"AUTOMATION" in the fifties was a word that meant glamor for some and fear for others. Now, after a decade of experience, the word has lost its impact, but production concepts it refers to are widely accepted. To the metalworking industry, "automation" is just another way of saying "increasing productivity by doing things more automatically." The concept is not new; it has always been the driving force behind more economical and efficient production. What is new is the accelerated rate at which it has developed in recent years.

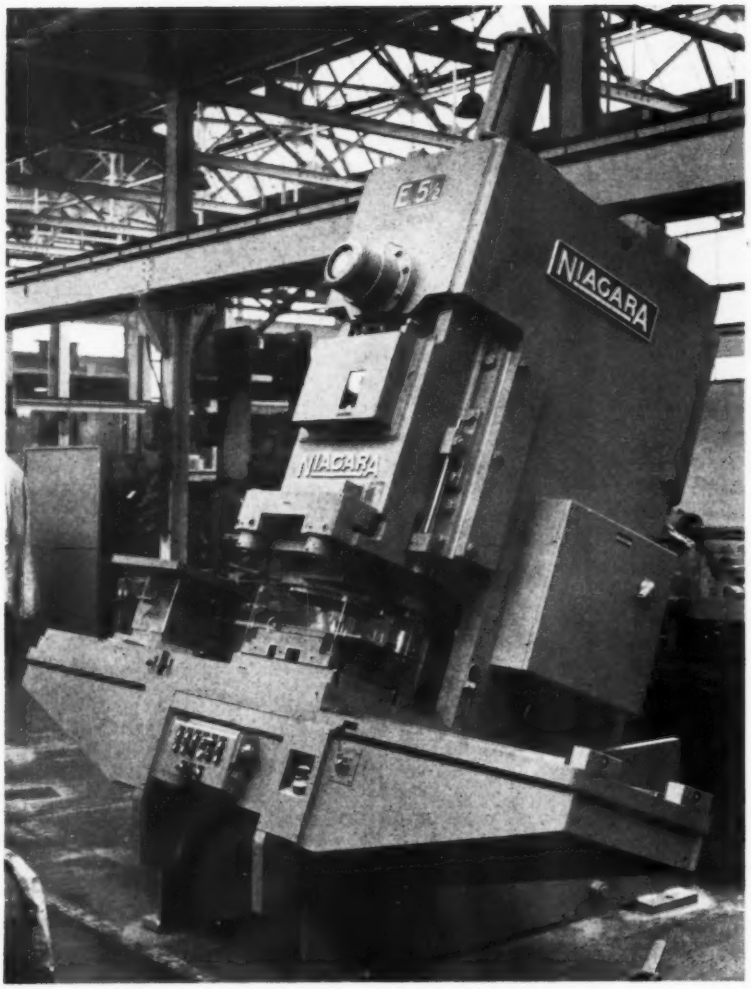
The most significant developments have been:
Building block construction of machine tools—standard units combined into large, multi-operation machines using special heads and fixtures.

Transfer machines — multi-operation machines linked by precision materials handling devices.
Automatic press cycles and mechanical arms.

Automated plants—built for maximum use of in-line transfer machines and automated press lines.

Tape control—increases automaticity of standard machines without the need for materials handling devices or combinations of machines.
General increase in mechanization—feed devices, automatic clamping, indexing mechanisms, automatic in-process inspection, electronic data processing, and materials handling.

The swing to more automatic production is a continuing one. It is dictated by the realities of competition and the need to keep costs down. The impetus also comes from the craftsmen and engineers who throughout history have had the inherent desire to find a more efficient way to do a job. Refinement of measurement techniques and bold new concepts in design of machines and products will pave the way for further increases in productivity.



Die Change Time Sharply Reduced

The sliding bolster has been associated with the big stamper league, since it has always been used on large presses, but Niagara has pioneered the use of the principle, with its many advantages, on small presses. Here it is shown on an OBI.

In this application it is simple to move a die in or out of the press by hand. It floats on an air cushion instantly provided by a lever. The die is secured in place by hydraulic clamps just as easily. After clamping, the die can't drop out in case of hydraulic or power failure because the clamping load is maintained mechanically.

A die change in an inclined press normally calls for righting the press first. This may be done with an overhead crane, an inclining mechanism, or by some other time-consuming method — the more time required the greater the production loss. With the sliding bolster, dies can be set up on the side with unobstructed overhead crane service while the press remains in production.

Not only can dies be easily handled, but duplication of previous die settings are easy through a power-operated slide adjustment.

Niagara announces the availability of this feature on straight side presses and large or small inclinables. For complete information write Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y., or circle Inform-A-Gram No. D4.

Die Steel Block, 8,500 lbs

The 1960 Philadelphia Metal Show displayed one of the world's largest forged blocks of high alloy die casting die steel, measuring 16x35x48, with a weight of 8,500 lbs.

Thermold AV "LO-AIR" Tool and Die Steel is being produced by Universal-Cyclops who installed the first steel vacuum stream degassing facility in the country for this purpose.

Exacting die casting jobs are handled easily because of Thermold AV's resistance to thermal shock and mechanical fatigue.

Ultra-Precise Strip

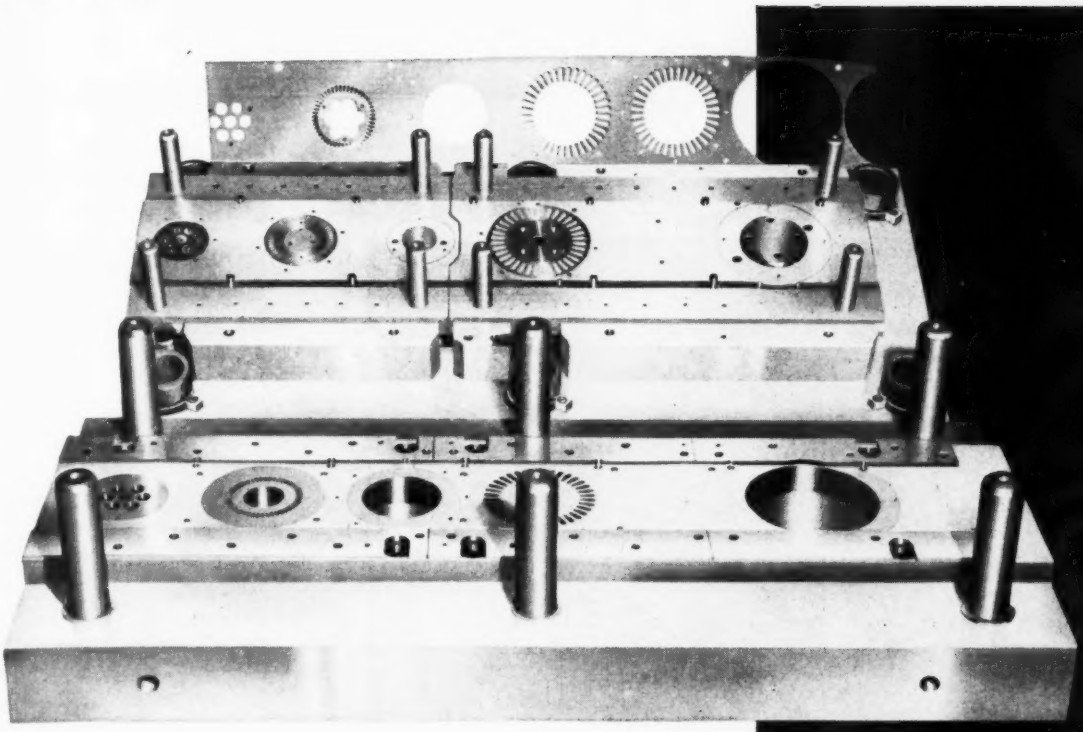
Ultra-micro precision thickness tolerances, not in thousandths, not in half-thousandths, but in ten-thousandths (0.0001) of an inch in metal strip, both ferrous and nonferrous, are now commercially available from Industrial Div., American Silver Co., Flushing, New York.

This extremely accurate metal strip was developed in response to an increasingly widespread requirement for the production of sub-micro precision parts used in aircraft, missiles, electronics, instruments and controls.

The perfect accuracy of this rolled metal (as close as ±½ of 1% of thickness) eliminates the need for precision grinding and lapping operations, minimizes dimensional rejects and speeds production.

In strip gages, it can be used where precision parts are to be stamped or formed from strip. In shim gages, it can provide the ultimate in precision tolerances when used in conjunction with forgings or castings that were previously machined only to commercial tolerances.

Known as ULTRA-MICRO PRECISION STRIP AND SHIM STOCK, it is available in brass, steel, aluminum, titanium, stainless steel and other metals in thicknesses from 0.0005 to 0.125 and in widths up to 6", depending upon tolerance required.



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Horizontal boring, milling, and drilling machines — table, floor, and planer types — 3″ to 14″ spindle diameters — positioning or contouring control.

Vertical boring and turning machines — 32″ to 20′ table sizes — positioning or contouring control.

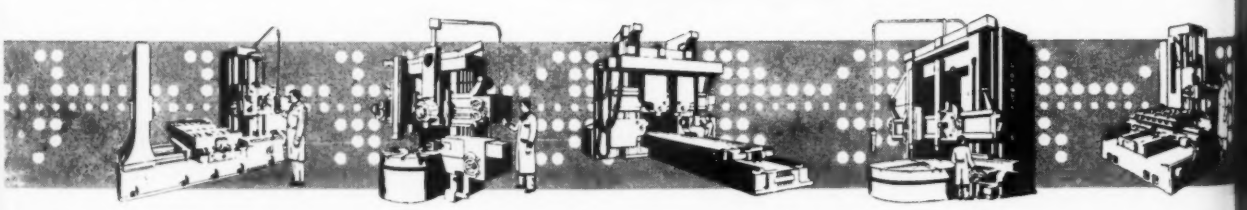
Jig borer and milling machine — combines heavy milling capacity with precision positioning under Numeripoint control.

DiMil and Variax horizontal contour milling machines — 2, 3, 4, and 5-axis — Numeripath controlled.

Planer mills — 36″ to 144″ table widths standard — positioning or contouring control.

Radial and precision drilling machines — with 2-axis Numeripoint control positioning tables — sizes to suit job requirements.

Call your Giddings & Lewis distributor or write for literature.



TAPE CONTROL "PACKAGE"

Machines. A complete new line designed and built to be operated under numerical control — horizontal boring, drilling, and milling machines . . . vertical boring and turning machines . . . combination jig borer-milling machine . . . contour milling and die sinking machines . . . positioning tables . . . planer mills.

Controls. The system of your choice, including Numeripoint* and Numeripath* controls of G&L design and manufacture to give you maximum productivity in point-to-point positioning or path machining, plus guaranteed responsibility vested in a single supplier.

Tape control training. G&L trains your operators when the machine is installed, teaches existing personnel how to program and prepare tapes, provides in-plant instruction of your maintenance men and conducts service training schools at Fond du Lac.

Reference material. Programming and control manuals thoroughly explain the equipment and procedures.

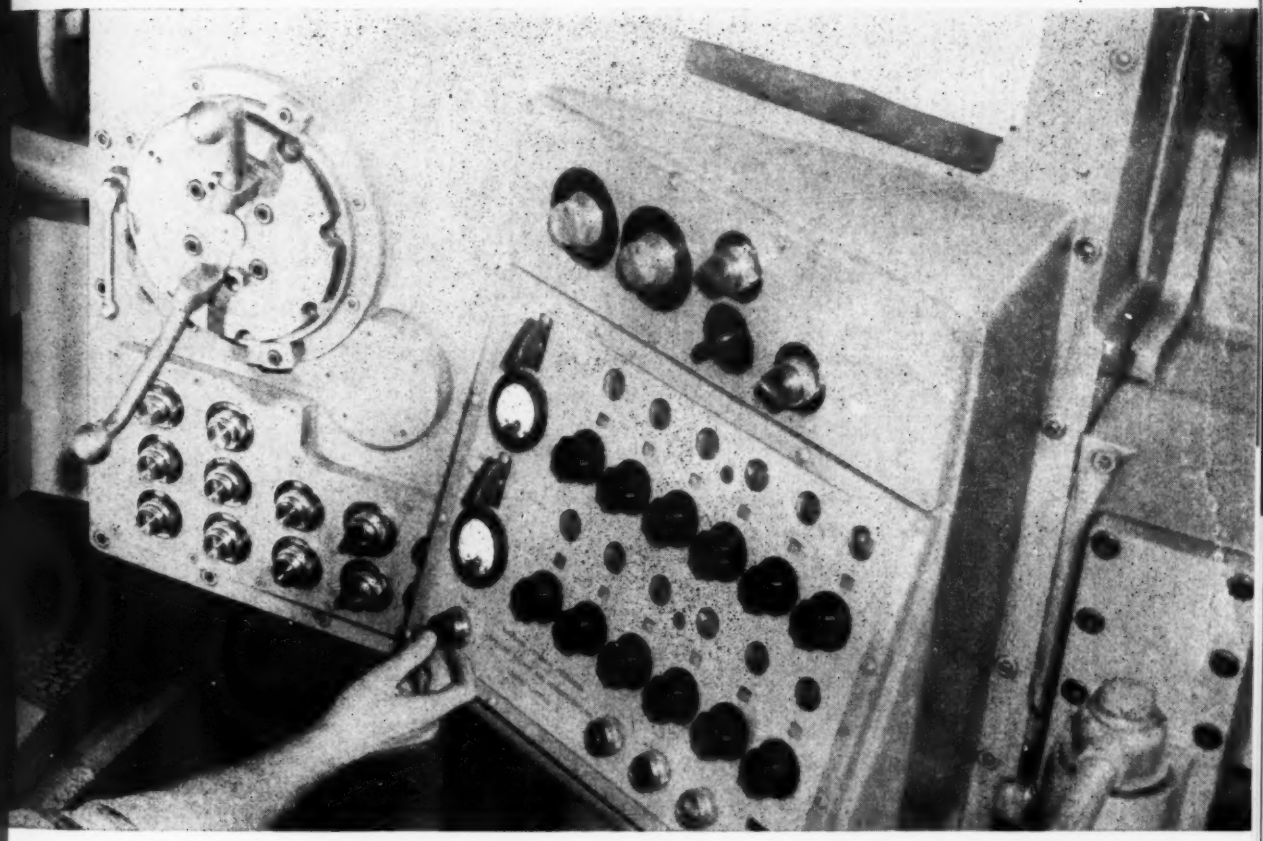
Cutting tools and toolholders. Davis pre-size VBM and VTL tooling . . . boring tools . . . arbors, sleeves . . . continuous-feed facing heads . . . tapholders for machines without thread leads . . . and special tools.

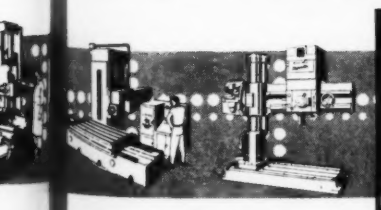
Accessories and attachments. Rotary tables, angular milling attachments, box-type angle plates, V-blocks, stop and jack blocks, measuring devices, and other equipment for speeding setups and production.

Consultation. Giddings & Lewis built the first commercially available tape-controlled machine tool, has shipped more types of major machines with numerical control than any other builder, uses tape control extensively in its own shops. This experience is available to help you justify, select, and apply numerically controlled machines for maximum manufacturing and economic benefits.

Ask for details and literature.

*Giddings & Lewis trademark





GIDDINGS & LEWIS

GIDDINGS & LEWIS

GIDDINGS & LEWIS MACHINE TOOL COMPANY, Fond du Lac, Wisconsin

Jig borer and milling machine; horizontal boring, drilling, and milling machines; vertical turret lathes; vertical boring mills; positioning tables; die sinking machines; contour milling machines; radial and upright drilling machines; planers; planer mills; numerical and tracer control systems; Davis boring tools.

T61-1

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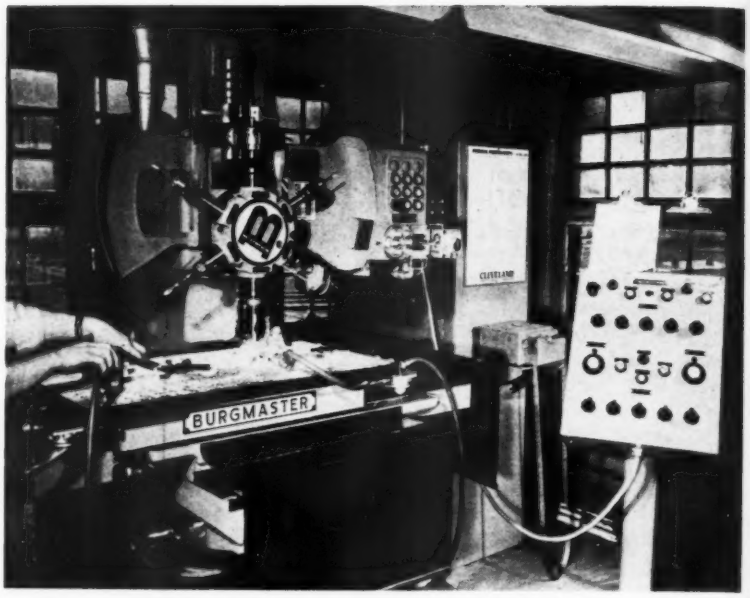


Fig. 1 Large work table allows two parts to be handled in same tape controlled cycle.

Taped Table Cuts Out Fixtures

A special work table and an efficient programming system are piling up benefits on short run production of precision plastic parts at National Vulcanized Fibre Co., Wilmington, Delaware. The company designed and built a table with 322 positioning holes drilled on 1½″ centers. It's used on a Burgmaster tape controlled turret drill to accommodate thousands of jobs without the need of fixtures.

The table is larger than the 15″ x 26″ working area of the machine, allowing productive use of the entire area. The machine can be programmed to handle two parts at the same time whenever both can be fitted into the work area (Fig. 1). This permits the operator to load one work station while the other is in automatic operation.

Additional savings have resulted from a programming system devised by National engineers.

When the approved engineering drawings of a part are returned by the customer, the drill holes are marked for reference. A process engineer then fills out a tool and positioning diagram sheet, specifying the correct drill sizes, speeds and feeds, and location of positioning holes. Because optimum rates are pre-selected for each run, tool life is considerably extended.

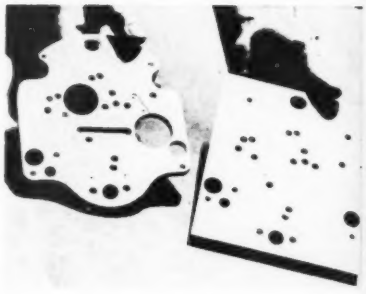


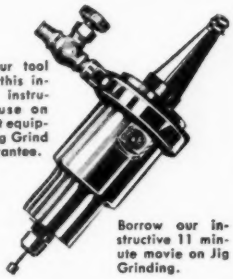
Fig. 2 Plastic part drilled by numerical control.

Next, a draftsman computes table and turret motions and lists them sequentially on a programming data sheet. This data is then transferred to Peerless fibre control tape, made by National.

The program sheet and tape then go to the operator (Fig. 3) who selects the correct drills for each spindle, sets speeds and feeds, and inserts the positioning pins as indicated on the positioning diagram. He inserts the tape in a tape reader and pushes a button to start the machine on its automatic cycle. end

Fig. 3 Choice of drills, feeds and speeds, and positioning of work is specified by data sheet.

HOLES JIG GROUND with *Vulcanaire*



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Alina bore gages are extremely sensitive and designed for trouble-free operation.
The three point centralization system locates the gage in the hole quickly and accurately.
Alina bore gages will swiftly reveal taper, bell mouth, out of round, and other dimensional variations.

A push-button retracts the movable anvil for easy non-scratching insertion into the workpiece. This feature also saves wear on the anvils.

Each gage is equipped with tungsten carbide contact points for lasting on the job accuracy. (except model WO-1).

Bore gages with measuring depths up to 40" delivered on special order.
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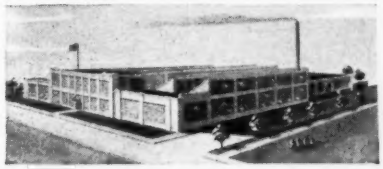

COLUMBUS DIE-TOOL & MACHINE CO.

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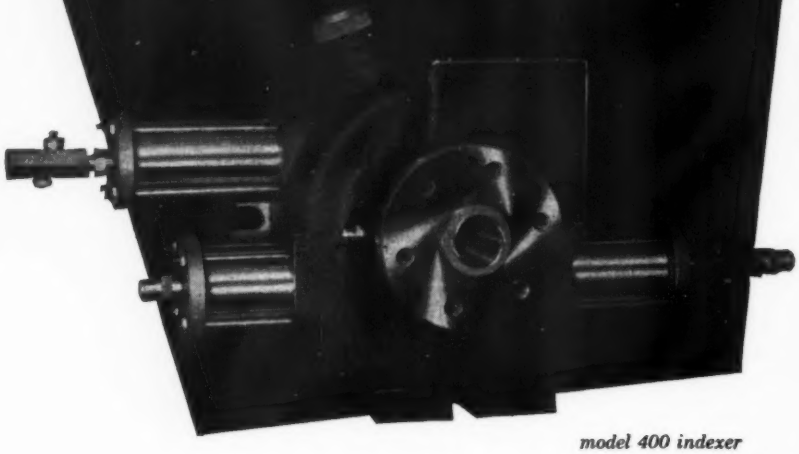
CIRCLE INFORM-A-GRAM KEY NO. 814

For speeding precision production

AUTOMATE

with

Erickson Indexers

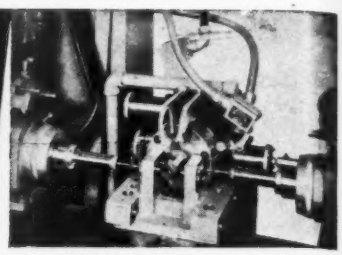


model 400 indexer

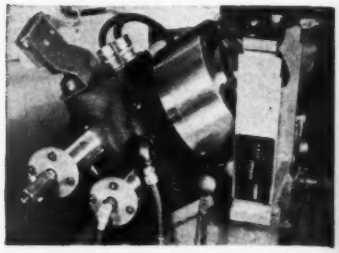
Perhaps these actual applications of automation will trigger your imagination . . . show you how Erickson Indexers can help you smash bottlenecks in your own production operation.

You can interlock them into production setups with microswitches and solenoid valves. And with Erickson Indexers you automatically get consistent positive positioning within 2 minutes of a degree . . . repetitive accuracy in low "tenths" of a thousandth.

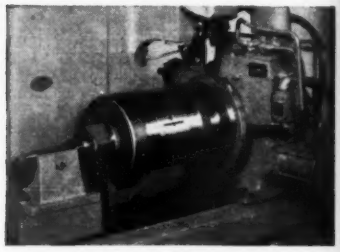
Speed to keep lines humming . . . accuracy to banish rejects . . . long life to slash maintenance and capital investment—all add up to Erickson Indexers. A-1342A



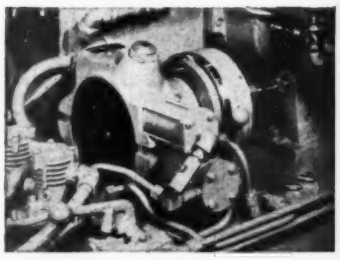
Automatic drilling of cross holes being done on Erickson Model 400 Speed Indexer with air cylinder and Expanding Drawbar Mandrel. Indexer equipped with interlock limit switches.



Angular drilling in jet part held in air operated collet chuck on Erickson indexer operating automatically. Entire fixture designed and built by Erickson.



Using end-clamping for half bearing, machine mills 8 oil grooves then skip indexes back to starting position for next part.



Milling four and six flats on needle valve part. Owing to size, part is placed in tail stock head-first, and tail stock then positions it in chuck and retracts.

ERICKSON TOOL COMPANY

34352 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPERATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
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• EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES (including gear-holding)
• BORING BARS • SPADE DRILLS • RECESSING TOOLS

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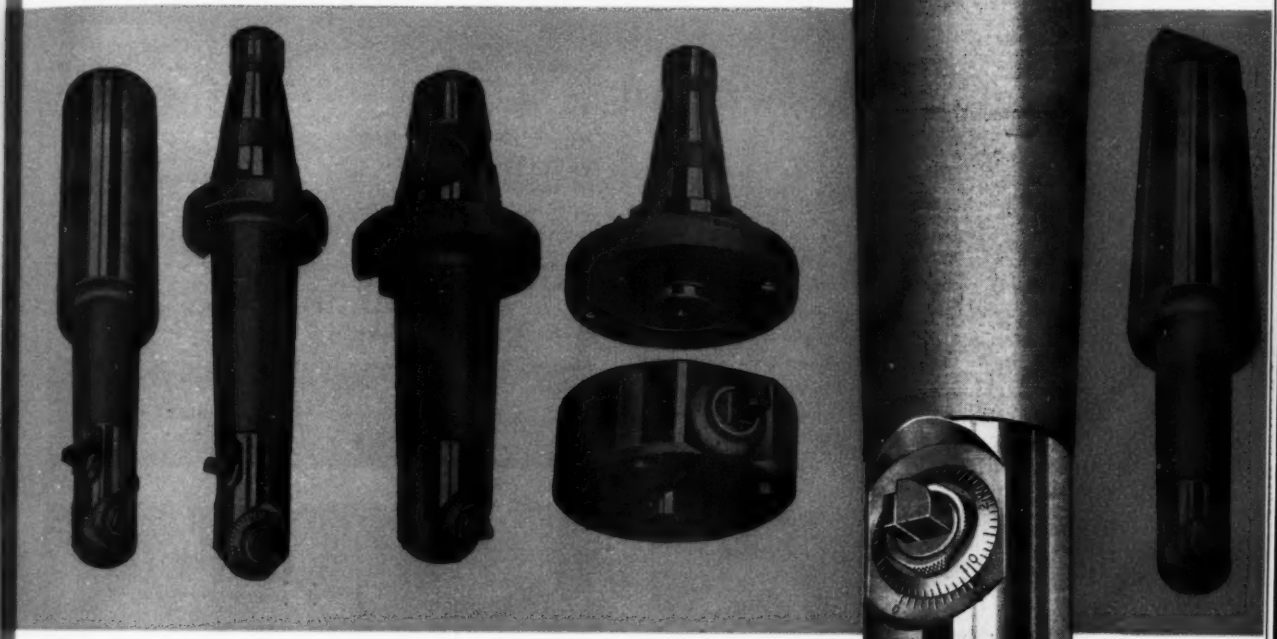

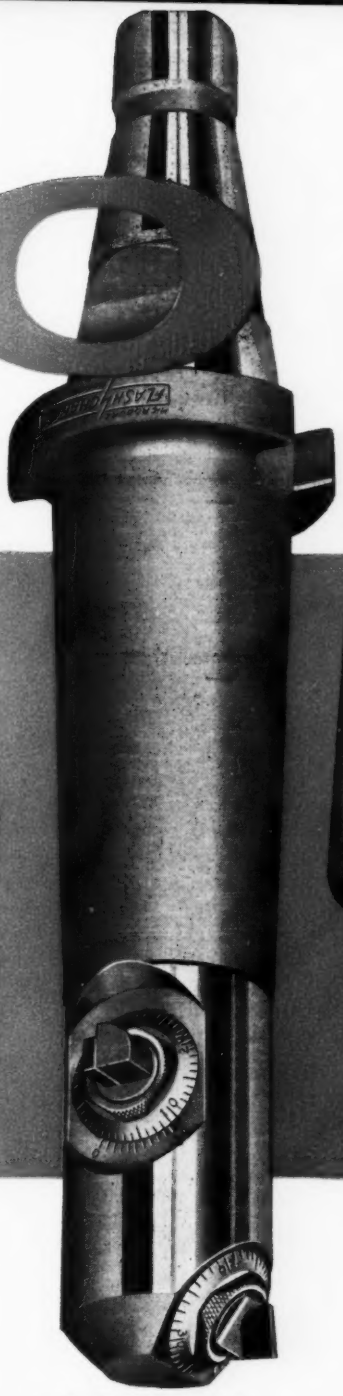

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Catalog No. 58 lists industry's most complete line of standard general purpose precision boring bars. Write for your copy.

Also available—special tooling designed from your part prints by our Proposal Engineering Department.

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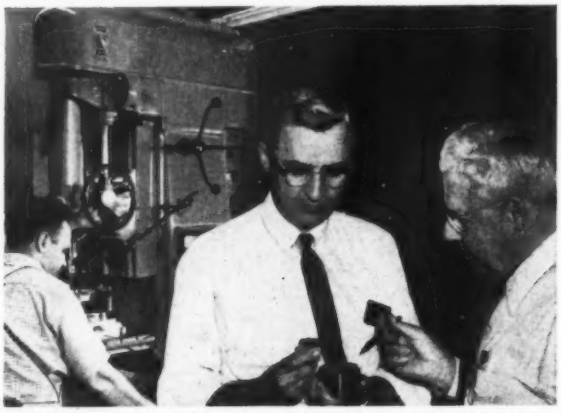
DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street, Royal Oak, Michigan

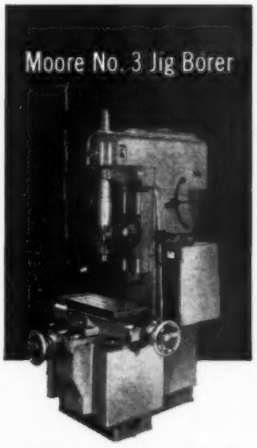
CIRCLE INFORM-A-GRAM KEY NO. 83

"The No. 3's split the tenths!"

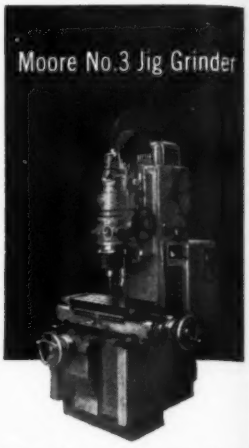
So report users of Moore's New Jig Borer and Jig Grinder



"Our operators feel that these are the best machines they have ever worked on. They take care of the tenth-splitting tolerances required by industry today. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines." These are the words of Herbert Harig, President (left above), and Karl Harig, Chairman (at right), Harig Manufacturing Corporation, Chicago, Illinois.



You will easily break the "tenth" barrier with this accurate machine. No gibs...no overhang...improved drive ...speed range of 60 to 2250 RPM...11 x 24" table working surface. It bores, drills, reams and spots holes in dies, jigs and production parts with unequalled speed and accuracy.



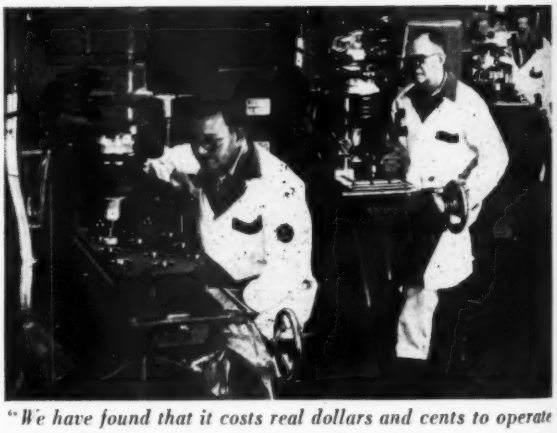
With this new, larger No. 3 model, you can grind—*with split-tenth* accuracy—holes plus regular and irregular contours to size and location after hardening. Faster strokes are provided for chop-grinding... infinite spindle speeds, 40 to 250 RPM...larger table working surface, 11 x 24".

All hardened, ground and lapped ways. Made and calibrated to the new international inch.

Write today for literature describing the many advantages of the No. 3 Moore Jig Borers and Jig Grinders.

MOORE SPECIAL TOOL COMPANY, INC.
300 Union Avenue, Bridgeport 7, Conn.

Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.



"We have found that it costs real dollars and cents to operate without Moore equipment. This cost factor is just one of many reasons why we recently added the new Moore Model No. 3 Jig Grinder. This Machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better." Statement by Val Koller, President, Koller Die & Tool Co., Milwaukee, Wisconsin.

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

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NOBLE & STANTON, INC.
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Do not scrap dull files. BBF Precision Grinding (BBFPG) resharpens dull files to new file efficiency: any length shape or cut. Results guaranteed. No acids or annealing. Ship dull files to sharpen to FACTORY: Beaver Falls, Pa.

B. B. Feldenfeld Co., established 1939
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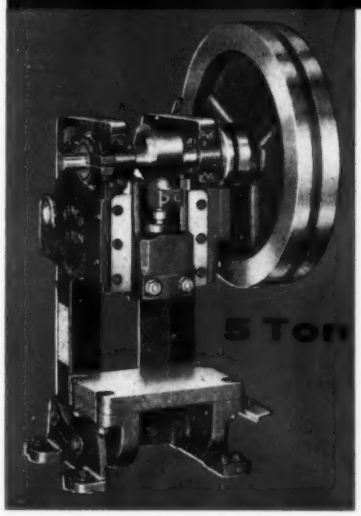

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also 18 & 26 Ton Presses—and Half Presses all Models.
THE MOST COMPLETE LINE OF SMALL PUNCH PRESSES IN THE WORLD

KENCO MANUFACTURING COMPANY
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MOHAWK STANDARD SUBLANDS are stocked in these three basic types in three step lengths and three shank styles. *All practical sizes and combinations.*

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Let Mohawk prove to you that a Standard Subland is the most efficient and economical tool to use for multiple drilling operations. Check your maintenance costs along with the number of pieces per grind. Mohawk will guarantee you a provable, substantial saving.

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TIMKEN®
***Fine Alloy* STEEL**

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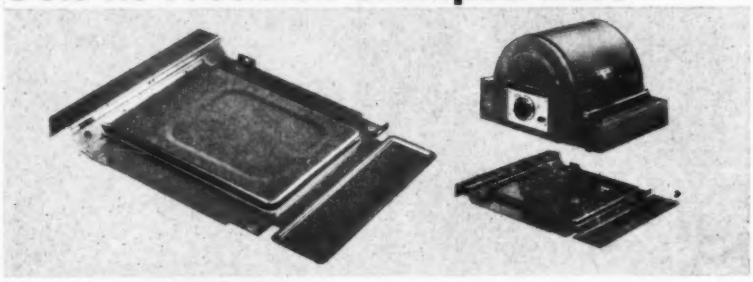
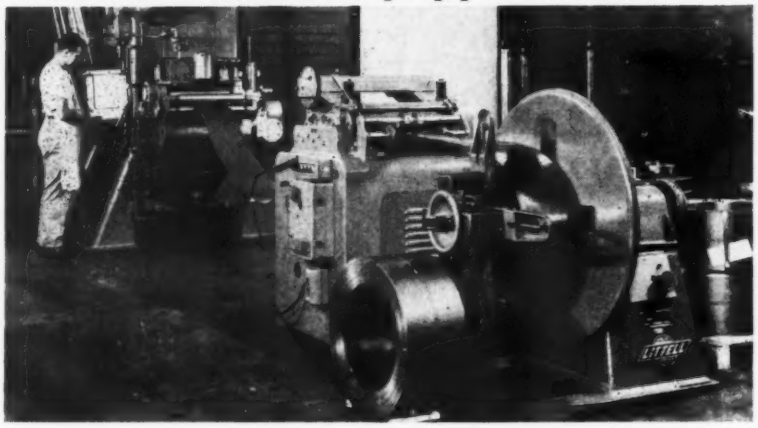
Eastman Kodak Verifax Copier

Gets Its Precision Stamped Base



On a *LITTELL*-equipped Press



As it swiftly, clearly copies anything printed, written, typed or drawn, the Verifax Copier rests on a base that is much more than a firm support. The base also secures and protects the heater element, the power cord, the wire assemblies, fuse, and thermostat assembly that are vital to high speed copying. To produce this Heater Base with precision and minimum waste, Eastman stamps it from coil stock that is Littell-handled all the way to the press die. Making up this all-Littell line are a No. 40-18 Reel, No. 418 Straightener and No. 6-18½ Roll Feed.

COILY Says . . . "The punch press you use can be brought to its peak in accurate, high speed, low cost stamping when a LITTELL line serves it."

F. J. LITTELL MACHINE CO.

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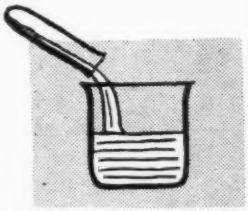
CIRCLE INFORM A-GRAM KEY NO. 90

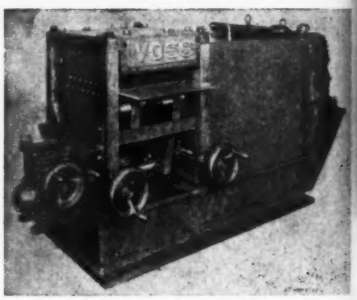
Lengthening Coolant Life



The high cost of unwanted bacteria in industrial coolants and cutting fluids was discussed at "The Bacteriology of Coolants" symposium held at the University of Toledo recently. Lengthening coolant life by inhibiting the growth of bacteria was suggested as one method for reducing costs.

James Landes, technical specialist for Elanco, speaking on "Bacterial Inhibition in Cutting Fluids" stated that rapid emulsion breakup in coolants is costing industry millions of dollars a year. He pointed out that bacterial growth, the cause of emulsion breakup, can be inhibited by chemical action, and stated that Elcide 75, Eli Lilly and Co., delays or prevents emulsion break, odor development, and corrosion when used in cutting fluids.

No Hands



Parts flattener is 47⅜" deep, 57⅛" long and 26⅜" high.

A stamped parts flattener small enough to fit on a desk top has been developed by Voss Engineering Co., Pittsburgh, Pa. It's said to maintain finished dimensions within 0.002 to 0.003 of dead flatness, and eliminate the need for hand straightening of parts.

Operation is based on a series of small diameter work rolls supported by multiple back-up bearings. Parts are worked to relieve stresses, obtaining near-perfect flatness in one pass.

It's yours in the Niagara line

A BIGGER PRESSFUL OF PERFORMANCE

Rigidly built, all-steel frames of patented, triple box section design.
Box-type, welded steel slides reinforced with heavy webbing.
Extra-long, adjustable gibs that fully contain the slide during working stroke.
Laminated, non-metallic ways . . . an exclusive Niagara press feature to prevent scoring.
Low-inertia pneumatic friction clutch and brake for trouble-free, high production.
Centralized pressure lubrication.
Operating controls conveniently arranged on master panel.
Unusually liberal shutheight and extremely long slide adjustment to accommodate a wide range of stamping and forming dies.

Here's a 250-ton Niagara Straight Side Double Crank Press, at contract metal stamping plant of Belmet Products, Inc., equipped with:
1 Roll feeds for progressive die work on coil stock.
2 Nine-station transfer feed mechanism and dies for work with pre-cut blanks . . . quickly removable as a self-contained unit.

Progressive die stamping . . . deep drawing . . . heavy blanking . . . lamination punching . . . you name it! Niagara Straight Side Single and Double Crank Presses are the profitable choice for numerous stamping requirements. No other line can match them in the middle capacity range. Once you've checked their operating and structural features, it's easy to see why.

Built in a combined range of 50 through 500-ton capacities, Niagara Series SC-1 and SC-2 Presses are available in non-geared, single geared or double geared models, with either single or twin-end drives. All can be outfitted with automatic feeds, adjustable speed drives, pneumatic die cushions, special controls and devices for automation.

Learn how you can get "a bigger pressful of performance." Be prepared for the next time you buy a straight side — single crank or double crank. Write for illustrated Bulletin 64. *Niagara Machine & Tool Works, Buffalo 11, N. Y., District Offices and Distributors Everywhere.*

NIAGARA straight side presses

SINGLE AND DOUBLE CRANK

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE INFORM-A-GRAM KEY NO. 91

how's this for high-speed hobbing?

WORK PIECE					HOB (1 start)				Pieces per Load	Method*	Time per Piece	Pieces per Grind	Cut
Dia. Pitch	No. of Teeth	Helix Angle	Face Width	Material	Dia.	RPM	Feet PM	Feed					
10	20	15°	$1\frac{3}{4}$"	1040 leaded	3"	500	395	.055"	1	A	2 min. 25 sec.	150	Finish
7	23	13°	$\frac{3}{4}$"	8620	4"	350	370	.100"	2	A and B	59 sec.	240	Pre-shave
5	43	24°	$1\frac{5}{8}$"	8620	4"	280	300	.100"	2	B	3 min. 45 sec.	80	Pre-shave

** Method A: Diagonal Hobbing. Method B: Step-by-step Hobbing.*

This is the kind of performance you get with

THE FELLOWS-PFAUTER P400 HIGH-SPEED HOBBING MACHINE

HIGH-SPEED HOBBING. Performance speaks louder than words. The examples given above show the results of high-speed hobbing which can cut costs. The figures are taken from the records of typical production runs on the Fellows-Pfauter P400.

DESIGN. The P400 was designed for High-Speed Hobbing, and it features a new basic design. The individual machine elements are of maximum rigidity. The hob head is heavy and rugged, the machine column and bed are of double-wall construction with heavy V-ways and the work table is as large as the maximum permissible work piece diameter. The index worm gear is nearly as large as the work table, and the work support column is of massive construction. All parts of the machine are properly proportioned and of sturdy design to eliminate vibration. The cost is more than justified by the resulting reductions in hobbing times and the increased hob life.

RIGIDITY and CLOSE TOLERANCES. The large size work table and index worm gear and the oversize hob head, which eliminates lead errors caused by hob breakout, are important factors in providing the rigidity necessary to hold work to close tolerances.

COMPLETELY OPEN WORKING AREA. The machine and the work-support columns are of such rigid construction that the hobbing stresses are absorbed without requiring an over-arm. Therefore the working area is easily accessible for set-up and work loading. The automatic retraction of the table from the hob also facilitates changing of work.

SET-UP TIMES and FLOOR-TO-FLOOR TIMES are reduced on the P400 because it has infinitely variable speeds and feeds, rapid traverses for all machine movements, including hob shifting manually by push button, and built-in hydraulics for the operation of the tailstock and simple hydraulic fixtures used on this machine.

AUTOMATION on the P400 is simple and fast. The illustrations show a machine equipped with automatic loading and unloading devices.

GEAR HOBBING COSTS can be cut by high-speed hobbing on a P400 because of the resulting savings in production time, floor space, maintenance and labor.

THE FELLOWS GEAR SHAPER COMPANY 78 River Street, Springfield, Vermont, U.S.A.

Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N.J.
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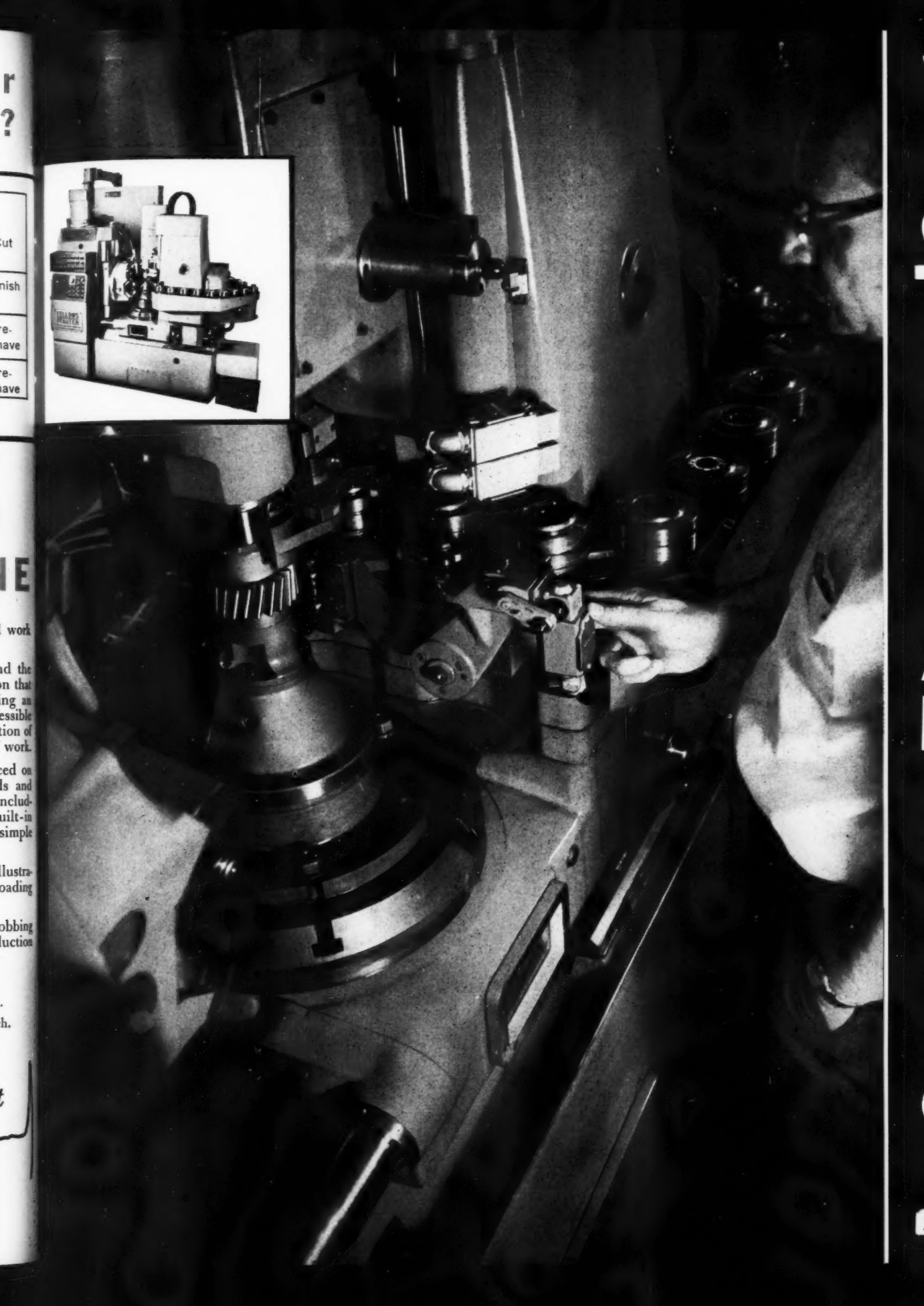
THE PRECISION LINE

Fellows

Gear Production Equipment

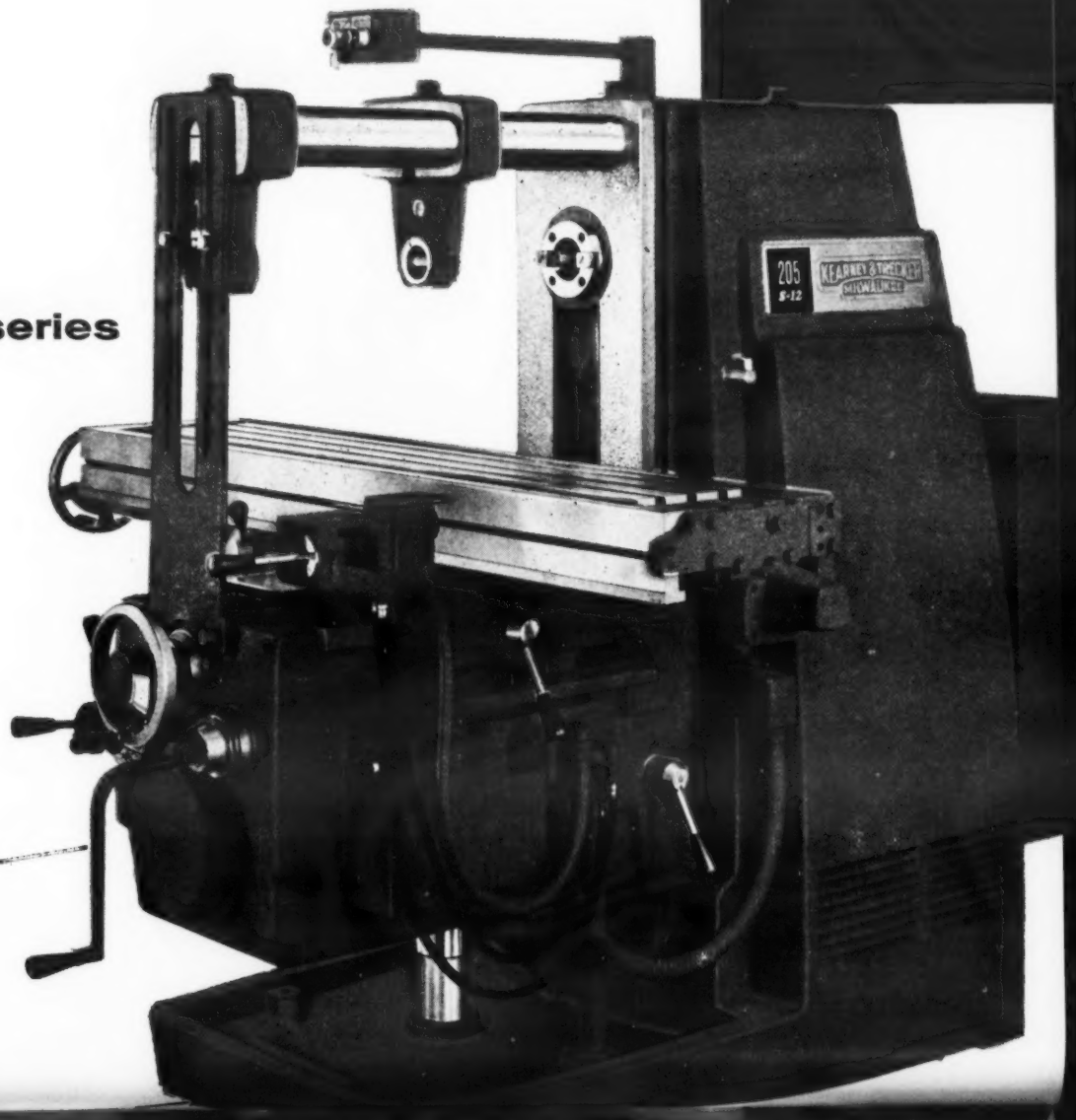
CIRCLE INFORM-A-GRAM KEY NO. 92


FELLOWS
SHAPER

MORE PARTS FASTER with the NEW S-12 series

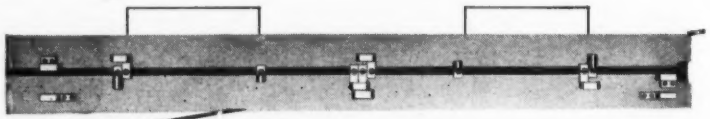
knee type milling machines

New Model 205 S-12
(5hp No. 2)



Unquestionably your first impression of the clean, functional styling of these all-new "*S-12's*" will be an immediate feeling of modern precision, strength, stability, and careful, thorough engineering. BUT — there's a lot more to these all-new "*S-12's*" than first meets the eye! There are time-saving, production-boosting features incorporated in this all-new "*S-12 Series*" that make it worthy of your most serious *Consideration and Comparison* if you have any thought of modernizing your plant facilities to increase productivity.

Here are but a few of the new "S-12 Series" features that can help you make more parts — faster.



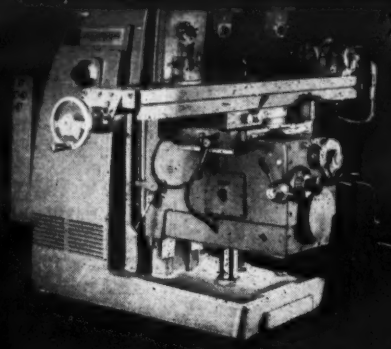
SIMPLIFIED TRIP DOGS . . .

COMPARE K&T's exclusive **AUTOCYCLE Control** for production milling with knee type flexibility and versatility . . . more parts faster with less effort, because idle time is automatically converted to cutting time. Four types of trip dogs — Feed, Rapid, Reverse, and Stop — mounted in a single slot on the front of the table, control a basic reciprocal automatic cycle. Automatic cycles can be to left and/or right for either conventional or climb milling . . . permit utilization of full table travel.

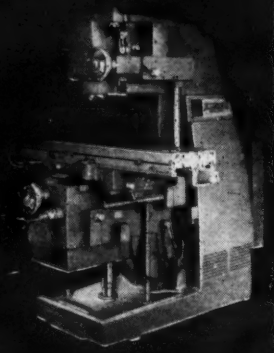
New 307 S-12
(7½hp No. 3)

COMPARE this new concept in single-lever control, the **MONO-LEVER**, a Kearney & Trecker "First" in the industry. On all **AUTO-**

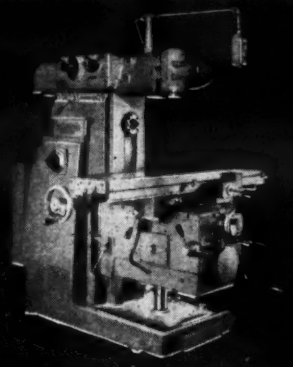
a single slot on the front of the table, control a basic reciprocal automatic cycle. Automatic cycles can be to left and/or right for either conventional or climb milling . . . permit utilization of full table travel.



New 307 S-12
(7½hp No. 3)

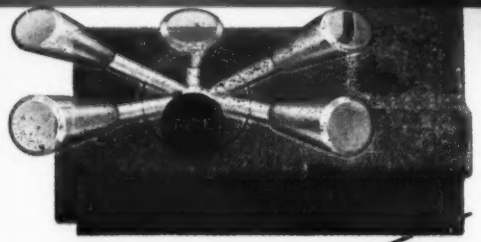


New 307 S-12
(7½hp No. 3)



New 307 S-12
(7½hp No. 3)

Available on TOOL LEASE
Minimum Capital Investment
Your Choice of 3 Plans



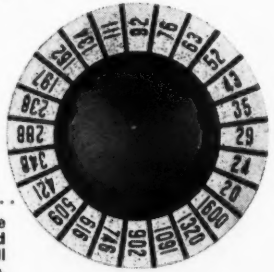
COMPARE the new concept in single-lever control, the **MONO-LEVER**, a Kearney & Trecker "First" in the industry. On all **AUTOCYCLE "S-12's,"** this single, six-position lever controls table feed, rapid traverse, AND rapid traverse movements of saddle, knee, and vertical head . . . is used for both manual or **AUTOCYCLE** control with equal advantage.

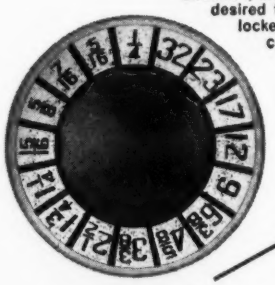
POWER ASSIST FEED CHANGE . . .

COMPARE the speed and ease of the **S-12 Feed Rate Change . . . a** simple pull and turn with these large, easy-to-read Feed Range Dials through the shortest arc in either direction, and the **S-12** is set to the desired feed rate. Changes are locked in without over-ride or coasting — change gears are hydraulically shifted and held.

QUICK-SET DIALS . . .

COMPARE this **S-12** time-saver, **Rapid-Set Micrometer Dials.** Non-glare finish for easy reading . . . spring-loaded. Merely pull out and rotate to desired setting, and release for quick, positive-lock settings . . . graduated in .001" increments. Handwheels and handcranks do **NOT** spin during power feeds or rapid traverse.





POWER ASSIST SPEED CHANGE . . .

COMPARE the ease of the **S-12 Speed Change.** Just a pull and turn of this large, easy-to-read dial through the shortest arc in either direction to select any of 24 speeds from 20 to 1600 RPM on the **295 S-12's.** 24 speeds, from 30 to 2400 RPM on the **307 S-12's.** Speed changes are locked in without over-ride or coasting. Shifting is smooth and quiet. Safety interlock prevents change being made during a cut.

AUTOMATIC BACKLASH ELIMINATOR . . .

COMPARE the **S-12's Self-adjusting Automatic Backlash Eliminator.** Makes climb milling just as easy as conventional milling. A mere twist of the wrist sets it for instant use in reciprocal milling cycles.

This is but a brief look, a mere smattering of the outstanding features incorporated in these all-new *S-12 Series* machines. They're literally new from top to bottom, inside and out, for truly modern cost-saving, maintenance-saving, fast, accurate, profit-producing operation.

All we ask is that you Consider and Compare these all-new Kearney & Trecker S-12 Series Milling Machines. Discover for yourself that there are none newer . . . none finer . . . none better suited for increasing productivity.

To assist you, the facts for your *Consideration and Comparison* — Bulletin No. S-60, and RS-60 will be mailed promptly upon request.

Standard Machinery Division

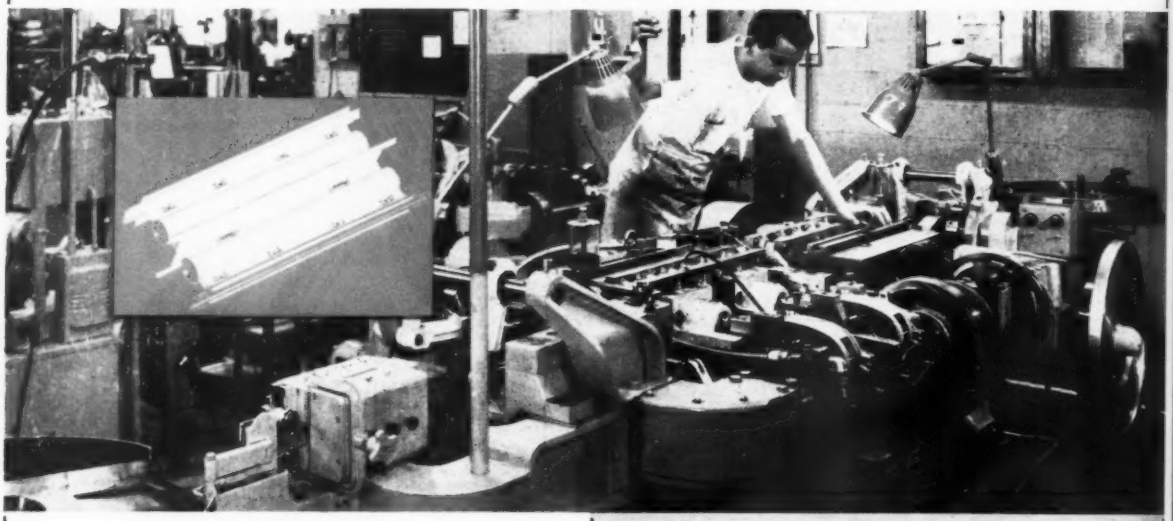
KEARNEY & TRECKER MILWAUKEE

KEARNEY & TRECKER CORP.
6800 W. NATIONAL AVE., MILWAUKEE 14, WIS.
(or phone GReenfield 6-8300... direct Distance Dialing Code No. 414)
CIRCLE INFORM-A-GRAM KEY NO. 95

U.S. DUPLEX MULTI-SLIDE INCREASES OUTPUT *of assembled components* BY 746%

CUTTING PRODUCTION OPERATIONS BY 66%

These are two of the benefits realized by the Precision Parts Section, General Electric Company, of Springfield, New Jersey, from just one U.S. Duplex Multi-Slide.

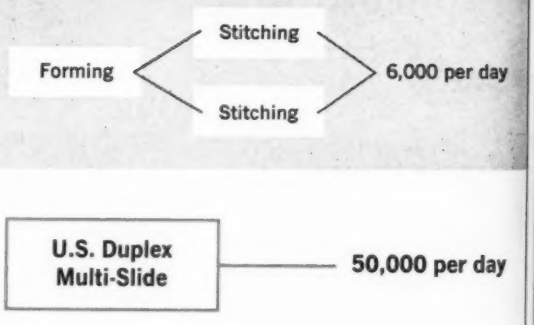


Until the installation of The new Symmetrical U.S. Duplex Multi-Slide, G. E.'s Precision Parts Section was producing complete rectifier plates at the rate of 6,000 per 8 hour day — in a 3 operator production set-up.

The U.S. Duplex Multi-Slide is the only symmetrical duplex machine of its type built.

Two or more parts can be produced simultaneously — and assembled where required.

Bulletin #36-P will be sent on request.



MULTI-SLIDE

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

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Tomco INC.

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SPECIALS

- HAND KNOBS
- MACHINE HANDLES
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GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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SAVED SAWS SAVE

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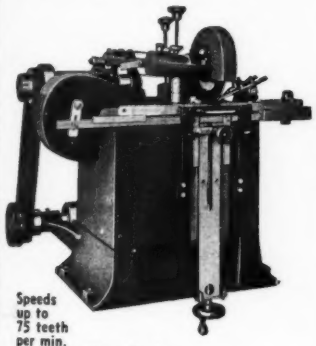
Sharpening a gross of hack saws just 6 times will return the price of this Model EC Combination HACK, BAND and CIRCULAR Saw Sharpener.



Speeds up to 75 teeth per min. As fine as 32 per inch.

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Rodgers Presses

FOR METAL FORMING and DRAWING

PRECISION HYDRAULIC POWER

From Rodgers "Standard" Line Select your "Custom" Model

Easy as A B C:

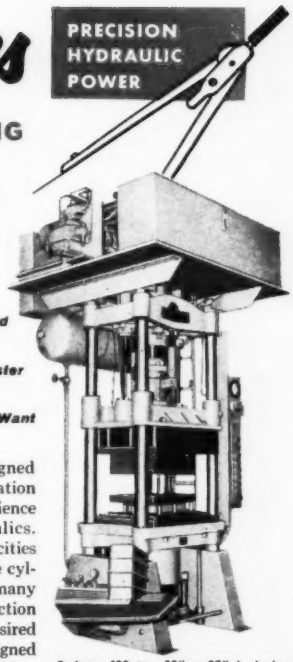
A — Determine Press Tonnage and Style Press You Need

B — Bed and Frame Size Required... Solid or Open Bolster

C — Select Pump Unit and Controls To Give Speed You Want

The New Standard line of Rodgers Platen Presses has been designed to greatly simplify press selection. From the basic press styles, one may be selected and combined with varied pumps and controls, automatic, semi-automatic or pressure sensitive, to give the desired speed and performance. This results in savings of "custom" engineering and costs.

Rodgers Presses are designed and built by an organization with over 32 years' experience in high pressure hydraulics. They are available in capacities from 50 to 400 tons, single cylinder or twin cylinders, in many standard models for production or special uses. Where desired custom models will be designed to suit exacting special requirements.



Rodgers 100 ton 30" x 30" bed size with complete one cycle automatic control for deep drawing.

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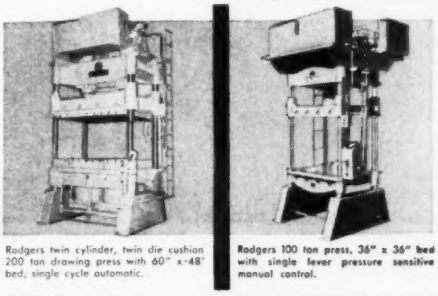
This new Rodgers Catalog has complete specifications, tables and data, making it simple to determine the press for the job. Write for your copy without obligation.



Rodgers twin cylinder, twin die cushion 200 ton drawing press with 60" x 48" bed; single cycle automatic.

Rodgers 100 ton press, 36" x 36" bed with single lever pressure sensitive manual control.

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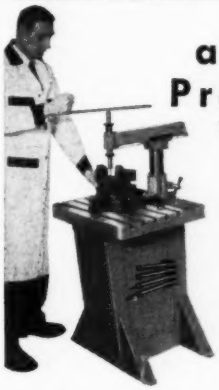

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TAP PERFECT HOLES— FAST!

- Rapid positioning over entire table area
- Floating tap finds true hole center
- Produces straight tapped holes

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THE PRODUCTO MACHINE COMPANY
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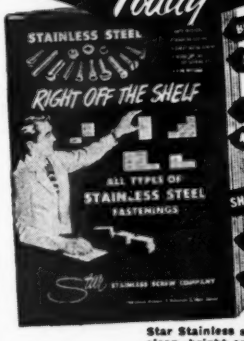

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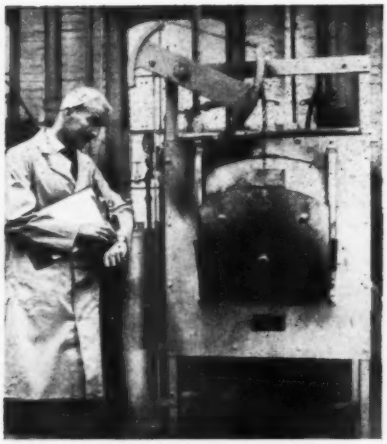
reduces heat treating costs

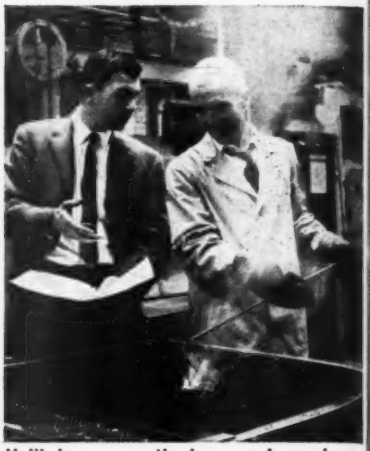


The man who heat treats many different tools . . .

can realize major savings with Crucible's new Tool Steel Service.

He'll operate his furnaces more efficiently and profitably because

he'll now be able to heat treat many more tools at one time.



He'll know exactly how each grade responds to heat treating.

—so he'll certainly get more consistent results by employing time-tested techniques.

All by standardizing on a few basic tool steel grades!

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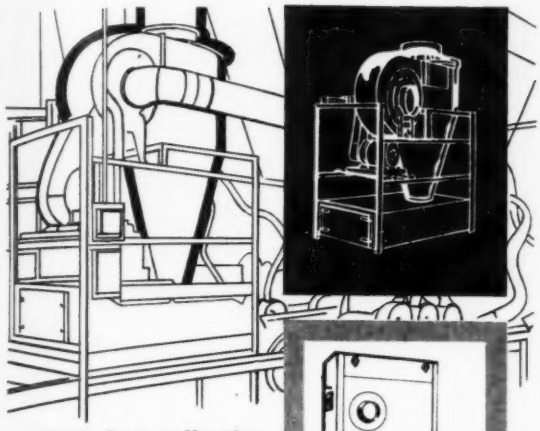

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—with a standard unit . . .

Regardless of your dust collection problem, chances are there is a space-saving Dustkop model to fit the job. Aget, for years, has led the field in efficient, compact design and has developed more than 50 standard Dustkop collectors. Each is job-tailored to most grinding, buffing or finishing operations—as well as many other types of service. Write for illustrated brochure that helps select your tailored Dustkop unit.

Also a complete line of mist collectors

C.S.A. APPROVED. Write for name of nearest representative in Canada

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Cutting Production Costs FAST!

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In a full size range, Ford precision tools are available from stock for all production cutting jobs in ferrous, non-ferrous and non-metallic materials. Consult your local Ford distributor.

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HI-ROC DRILLS
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GRINDING BURRS

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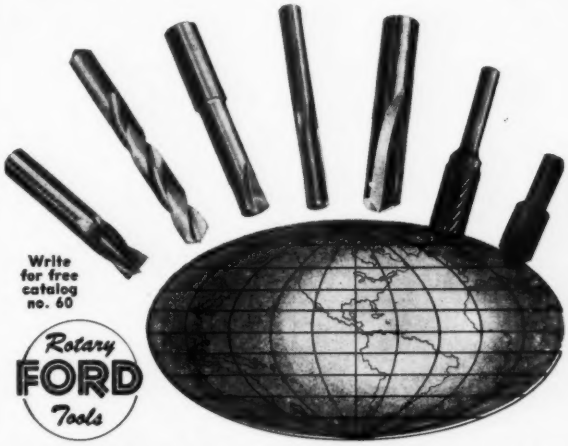

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Rotary FORD Tools

M. A. FORD MFG. CO., INC., Dept. TP161, 1545 Rockingham Rd., Davenport, Ia.
Manufacturers of Precision Machine Tools

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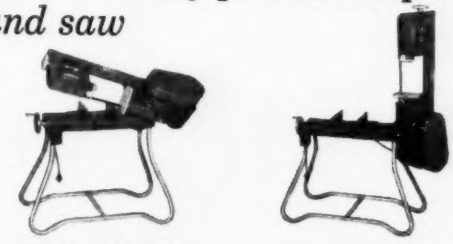


Use it as a horizontal cut-off machine.

Use it as an upright band saw.

THE NEW WELLS MODEL 300 METAL CUTTING BAND SAW

Would you like to make your metal cut-off jobs easier and more efficient? Would you like to be able to cut angles, slots, notches and bevels in the same machine?

You can do all of this with the new economical-to-buy and economical-to-use Wells Model 300 Metal Cutting Band Saw. Just check these features:

- 3½" x 6" capacity (3½" dia., rounds)
- Selective speeds of 54, 100, 190 ft. per min.
- Gravity feed and automatic shut-off for cut-off work
- Exceptionally rigid construction
- Well guarded—blade can be changed without removing guard
- Optional wheels and handle for complete mobility

Get full details on this remarkable value from your Wellsaw Representative or write for Bulletin No. 230.

61-1A

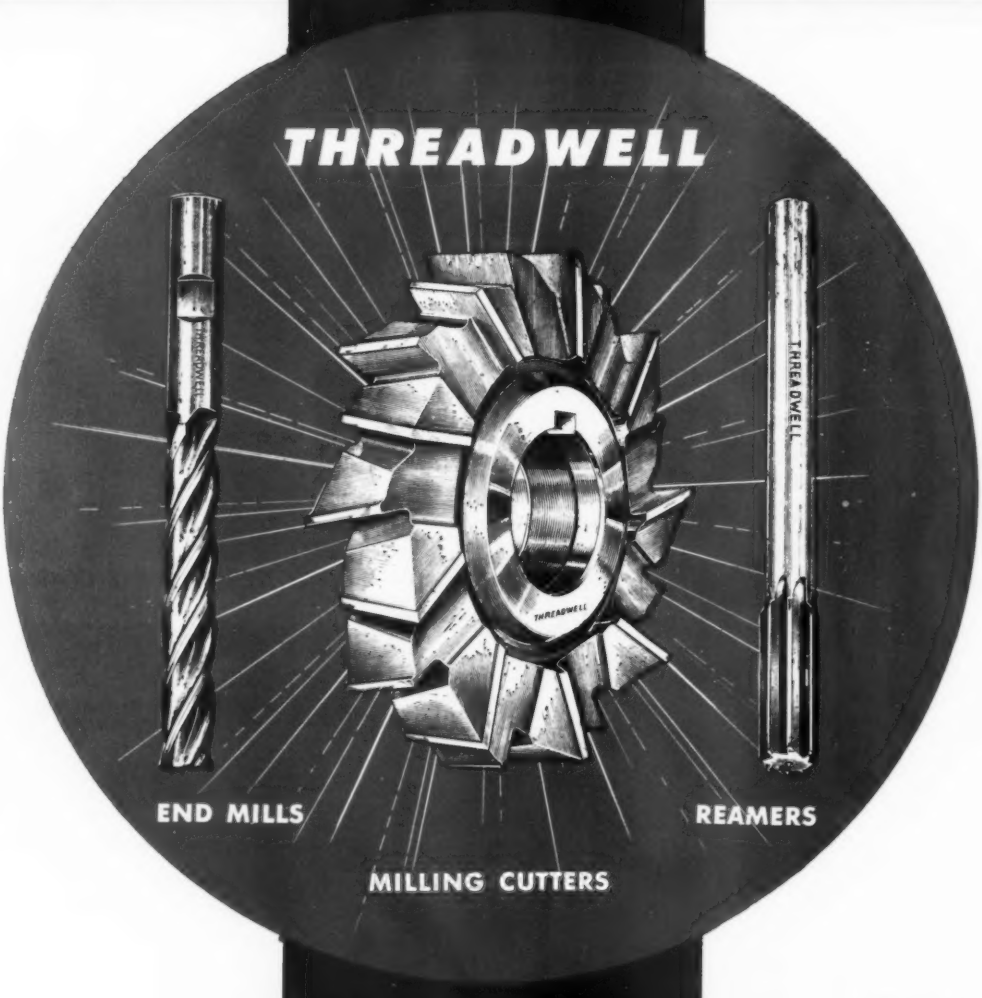
Wells SAW SPECIALISTS SINCE 1925
WELLS MANUFACTURING CORP.
1940 CEDAR ST., THREE RIVERS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 994

BRAND NEW

to complete the finest line
of cutting tools in the industry

THREADWELL



Your
Threadwell Distributor
is your partner
in productivity.
See him now.

Threadwell
INDUSTRIAL DISTRIBUTORS
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

THREADWELL TAP & DIE CO.
GREENFIELD, MASSACHUSETTS

Stocking Warehouses: New York — Cleveland
Detroit — Los Angeles — Greenfield, Mass.

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READER SERVICE CARD — JAN. 1961 ISSUE

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INFORM-A-GRAM

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4	16	28	43	87	104	117	163	974	1243	1331	1373	1443	1481	1541	1603
5	17	29	44	88	105	119	165	975	1244	1332	1391	1444	1491	1542	1604
6	18	31	45	89	106	120	166	991	1261	1333	1392	1445	1492	1543	1605
7	19	33	46	90	107	121	811	992	1262	1351	1393	1451	1493	1544	1606
8	20	34	48	91	109	123	812	993	1263	1352	1411	1452	1511	1561	1611
9	21	36	59	92	110	125	813	994	1291	1353	1412	1453	1512	1571	1612
10	22	37	72	95	111	127	814	1221	1292	1354	1413	1461	1513	1572	
11	23	38	77	96	112	128	851	1222	1293	1355	1421	1462	1514	1581	
12	24	39	79	98	113	150	852	1223	1294	1356	1431	1471	1531	1582	
13	25	40	82	100	114	152	971	1224	1311	1357	1432	1472	1532	1583	

EDITORIAL ITEMS

C1	C13	C25	C37	C49	P2	P14	P26	P38	P50
C2	C14	C26	C38	C50	P3	P15	P27	P39	P51
C3	C15	C27	C39	C51	P4	P16	P28	P40	P52
C4	C16	C28	C40	C52	P5	P17	P29	P41	P53
C5	C17	C29	C41	C53	P6	P18	P30	P42	P54
C6	C18	C30	C42	C54	P7	P19	P31	P43	P55
C7	C19	C31	C43	C55	P8	P20	P32	P44	P56
C8	C20	C32	C44	C56	P9	P21	P33	P45	P57
C9	C21	C33	C45	C57	P10	P22	P34	P46	P58
C10	C22	C34	C46	C58	P11	P23	P35	P47	D2
C11	C23	C35	C47	D1	P12	P24	P36	P48	D3
C12	C24	C36	C48	P1	P13	P25	P37	P49	D4

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of TOOLING & PRODUCTION readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured —all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the number of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year, and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

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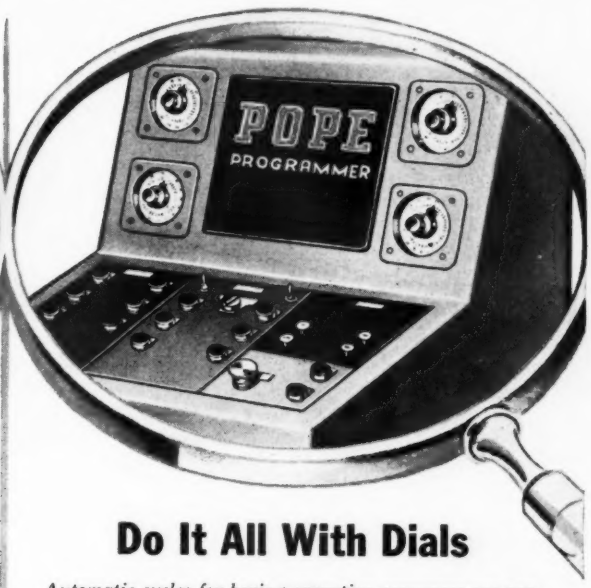
YOU CAN INCREASE PROFIT AND PRODUCTION

with this new POPE 10-6 SUPER-PRECISION BORING MACHINE



Two Heads Are Better Than One

and of course you can have more than one spindle in each head. The Pope Model 10-6 features *two precision boring heads** operating completely independently of each other to provide simultaneous or alternate cycling movement of the heads. *This means increased production.*

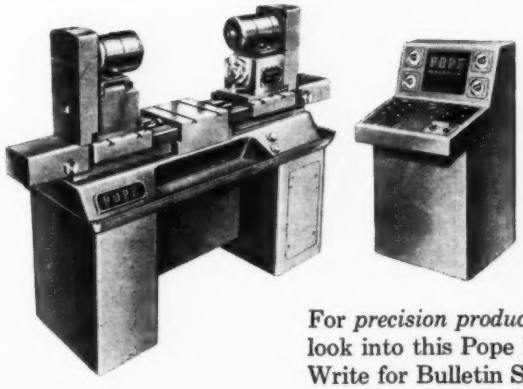
*The Pope Boring Head Spindles on this machine revolve within 20 Millionths.

Do It All With Dials

Automatic cycles for boring operation sequences are programmed on these dials. The operator simply determines the sequence of operations and dials each one. You get continuous production of uniform parts in less time.

The Pope Electric Programmer gives you finger-tip fast control of infinitely variable speed, distance and operating sequence. You dial in the complete program with ease and speed that beats expensive numerical or tape control. Constant accuracy is maintained for cycle after cycle.

- Table dimensions—12"x12"
- Maximum stroke, each head—6"
- Standard center height—5½" (variable)



No. 132

For *precision production at a profit* look into this Pope Model 10-6. Write for Bulletin S-21.

POPE®

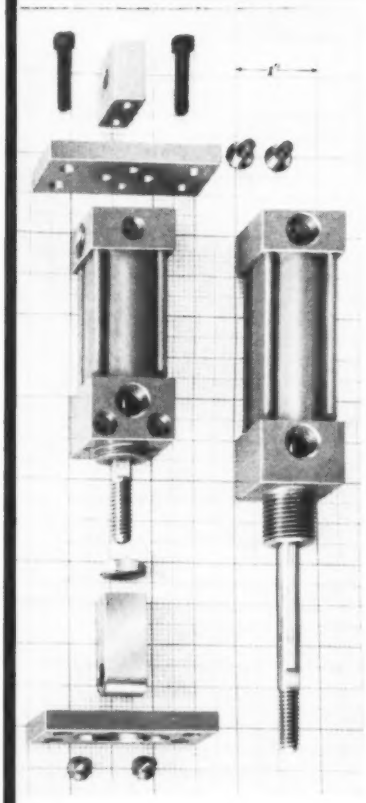
ENGINEERS, DESIGNS AND BUILDS PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

CIRCLE INFORM-A-GRAM KEY NO. 101

HOW SMALL
do you want 'em?



Hannifin offers new "Midget-Air" 200 psi cylinders in ¾", 1" and 1⅛" bores, double-acting or spring-return. Two basic models, "universal" and "nose-mounting." Universal models come drilled and tapped for mounting, or for use with any combination of the mounting attachments pictured. Delivery is off-shelf in standard strokes, shipment in ten days to specified stroke lengths. Want dimensions and prices? Write:

PARKER HANNIFIN CORPORATION
PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS
HANNIFIN COMPANY
A DIVISION
563 South Wolf Road
Des Plaines, Illinois

3299-P11
CIRCLE INFORM-A-GRAM KEY NO. 103

Big Eye

The world's most powerful x-ray machine of its type — specifically designed for radiography in the metals industry — will be installed at the A. O. Smith Corp.'s Milwaukee, Wis. plant next spring.

The eight million electron volt linear accelerator is now being built by the High Voltage Engineering Corp., of Burlington, Mass.

The "linac" is designed to "see" through steel more than a foot thick and to furnish photographic proof of the soundness of such metal structures as core barrels for nuclear reactors and high pressure vessels.

Warren Hendricksen, general manager of A. O. Smith's atomic and process equipment division, said that the project would cost $700,000 when completed. The installation, he pointed out, is part of the division's $4,000,000 long-range expansion program.

The linac will be an extremely valuable tool to insure reliability, particularly in those products designed to handle nuclear matter or to operate at extremely high pressures.

Engineers for the High Voltage Engineering Corp. said that several lower power linacs now in use produce about 1/6 of the radiographic intensity of this equipment.

The linac differs from other radiographic equipment in that it produces its x-rays by "firing" high energy electrons in a straight line down an evacuated tube. Electrons move down the tube impelled by travelling radio-frequency waves. These "radar" pulses accelerate the electrons until they approach the speed of light. At the end of the tube, the electrons strike a tungsten target and produce penetrating x-rays which are beamed upon the material to be examined.

Using eight million electron volts, the linac will produce 6,000 roentgens/min. While some other types of equipment employ high voltages, they do not produce x-rays of such high intensity.

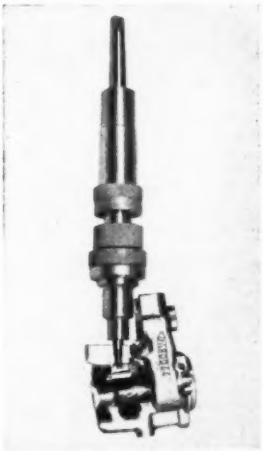
For example, at full power and at a distance of nine feet, the five millimeter source will x-ray 11" of steel in about one min, or 16" of steel in about 18 min. A smaller one-millimeter source provides even greater clarity or resolution, and will radiograph 8" of steel in about one min, or 14" in about 30 min.

Small Recessing Tool Accurate For Carburetors

The Holley Carburetor Co. is now using Maxwell Industries' newest and smallest recessing tool, engineered to enter a 0.300" dia hole and provide sturdy support for the cutter as it automatically backfaces internal ports and seats of carburetors.

Use of this Maxwell JS recessing tool results in extreme accuracy in deep holes where no cutter deflection is permissible. Its design maintains the cutter in rigid support close to the area of the work without the need of supporting jigs. Its automatic operation is controlled by ball-bearing stops so that the tool will not mar the work.

Using Maxwell's standard JF recessing tool mechanism, the spindle assembly is Maxwell's exclusive gear-rack-actuated type of tool, which eliminates the most



common wear point in ordinary cam or pin-type actuation. Its feed ratio is approximately 7.5:1 which, combined with the positive feed of eccentric cutter holder, assures trouble-free recessing with fine finish and exceptional precision.

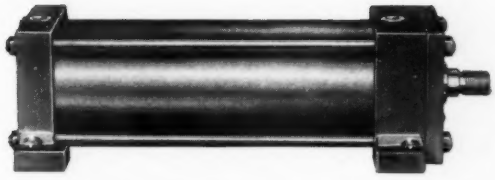
SAVE TIME, AIR, MONEY

with PARKER-HANNIFIN One Source Engineering

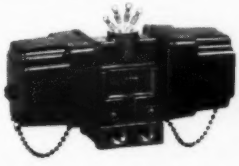
Your pneumatic system shapes up faster at the design stage when one man can discuss with you every component you'll need. But have you realized how much your Parker-Hannifin man can save you in money and air?

Just for instance . . . your valves don't have to be ¾" just because the cylinder size you select comes with ¾" ports. Your Parker-Hannifin man chooses valve types and sizes to suit the air flow you'll need. He'll show you too, how pressure control saves money and air, how a smaller lubricator is often a more efficient lubricator, and other money saving ideas. Then he'll show you ways to "tube up" and "hose up" a leakproof pneumatic system quicker, neater and at lower cost.

Call your nearest Parker-Hannifin sales office, or write direct for complete information.

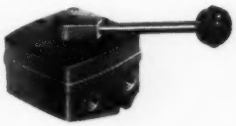


Low friction, long packing life are money-saving features of the Hannifin Series "A" pneumatic cylinder, available in a full range of mounting styles and from 1½" to 14" bore, strokes to 20 feet. Hannifin cylinder application data and charts make selecting the right Series "A" cylinder easy. Get yours from your Parker-Hannifin man.



DUAL SOLENOID, 4-WAY

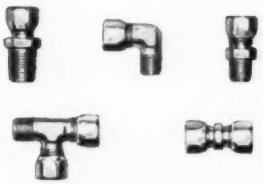
PRESSURE, 3-WAY



HAND, 4-WAY

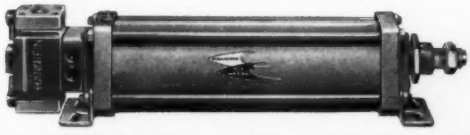
CAM, 3-WAY

Use flow factors as money-savers—your Parker-Hannifin man can show you how. They help you to avoid "oversizing" your valves. Hannifin's new Valve Finder gives "C_V" ratings for every valve in the line, makes it possible for you to take full advantage of the extra air-flow capacity in Hannifin air valves. Get your copy today.

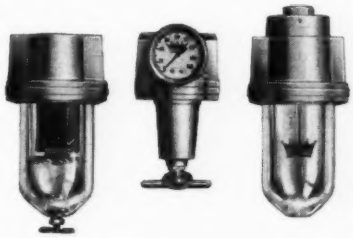


Pneumatic systems tube up fast with Parker "Intru-lok" tube fittings. Use them with copper, nylon or "Parker-POL" polyethylene tubing. Just insert the tube and tighten the nut for a leakproof "bite-type" joint.

Another time-saver is "Push-lok", the Parker hose-and-hose-fittings combination for pressures to 250 psi. No tools needed. Just push this hose on these hose fittings. They won't blow off, ever, not at twice 250 psi.



One air line connection installs the Hannifin Air Motor . . . an integral solenoid valve controlling a fast, rugged double-acting air cylinder. Built-in speed controls adjust piston speed in either or both directions.



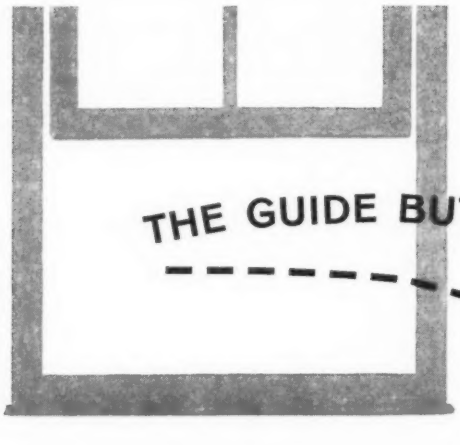
You will save both air and money with Hannifin "Crown" air line filters, pressure regulators and lubricators. Let your Parker-Hannifin man show you how they pay for themselves by making it possible to get all the air flow you need at the exact pressure that will best do the job. "Crown" filters and lubricators will bring further savings through reduced equipment maintenance.

PARKER HANNIFIN CORPORATION

Parker FITTINGS AND HOSE DIVISION
17325 Euclid Avenue • Cleveland 12, Ohio
HANNIFIN COMPANY
A DIVISION
563 South Wolf Road • Des Plaines, Illinois
PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

3139-PH-c

CIRCLE INFORM-A-GRAM KEY NO. 103

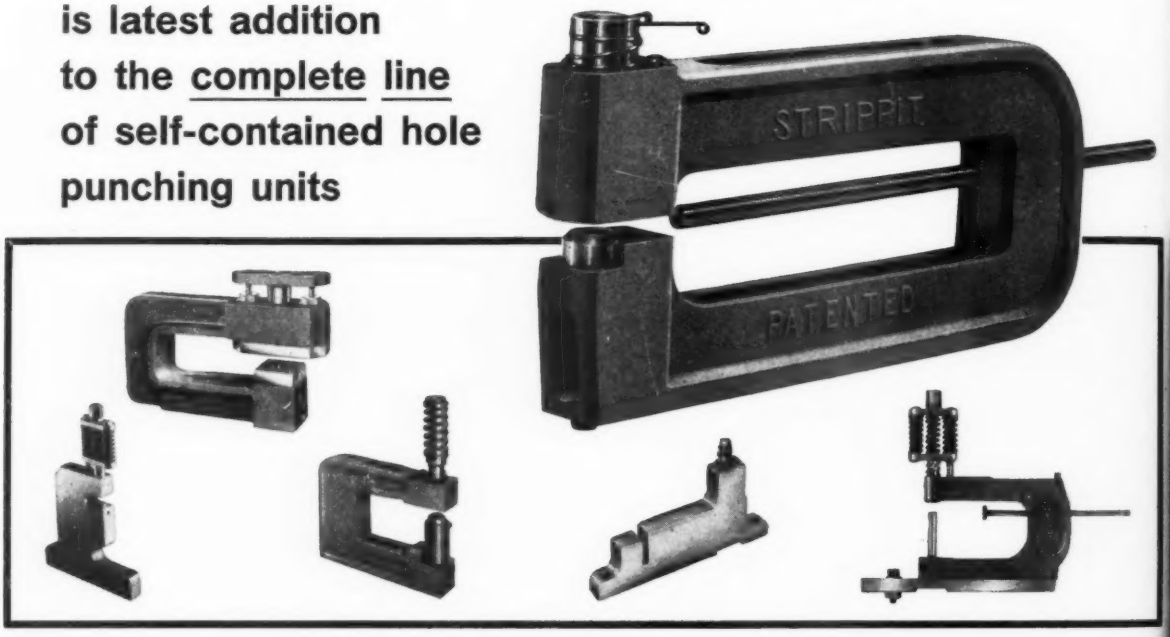


Wales STRIPPIT's new "BN" units have been designed for use *with or without* a guide button. Now, with this exclusive feature, only a punch and die (round or shaped) are required when you change from one hole size to another. For special applications and for optimum hole quality, the option of using a fitted or closed guide is still available.

THE GUIDE BUTTON GOES OUT THE WINDOW

NEW STRIPPIT "BN" SERIES

is latest addition to the complete line of self-contained hole punching units



Only STRIPPIT's "BN" units offer all these features:

- Use of fitted or closed guide button optional.
- All holders keyed for *both* round or shaped punches and dies.
- Self-storing keys supplied with each holder.
- Streamlined holder permits punching closer to leg of formed flanges and angles.
- New die section design permits easy removal and rotation of die without removing holder from set-up and retains the advantages and strength of one-piece construction.
- New threaded gage rod positions work more accurately and positively.
- All units, including ¾" unit, have hold-down slots for easier mounting.
- New stripping guide slips out quickly and easily without taking off retainer clip.
- One-piece oil hardened tool steel punches.
- Series expanded to include maximum hole size of 3½" in 10 gauge material.

WALES **STRIPPIT** INC.

A UNIT OF HOUDAILLE INDUSTRIES, INC.

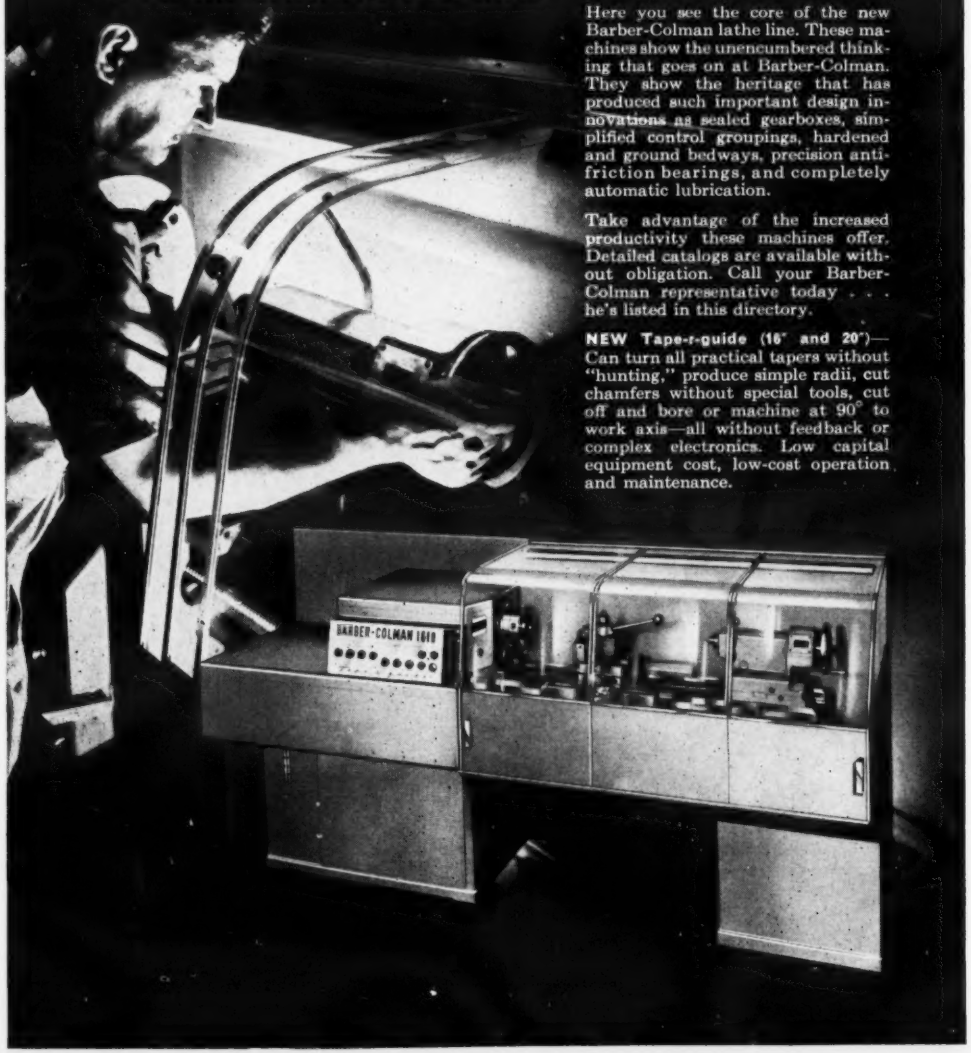
212 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario
In Continental Europe: Raskin S.A., Lausanne, Switzerland *In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England*

CIRCLE INFORM-A-GRAM KEY NO. 104

The New Ideas in Turning...

are from BARBER-COLMAN

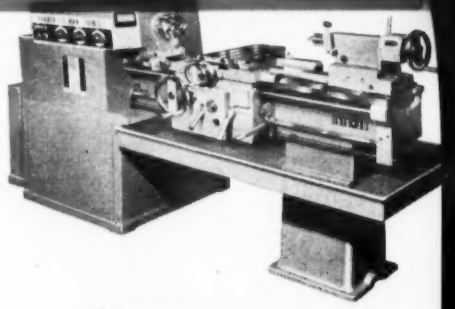


Here you see the core of the new Barber-Colman lathe line. These machines show the unencumbered thinking that goes on at Barber-Colman. They show the heritage that has produced such important design innovations as sealed gearboxes, simplified control groupings, hardened and ground bedways, precision antifriction bearings, and completely automatic lubrication.

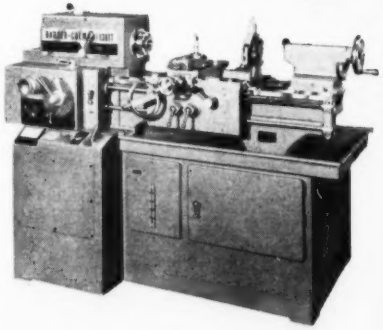
Take advantage of the increased productivity these machines offer. Detailed catalogs are available without obligation. Call your Barber-Colman representative today . . . he's listed in this directory.

NEW Tape-r-guide (16" and 20")—Can turn all practical tapers without "hunting," produce simple radii, cut chamfers without special tools, cut off and bore or machine at 90° to work axis—all without feedback or complex electronics. Low capital equipment cost, low-cost operation and maintenance.

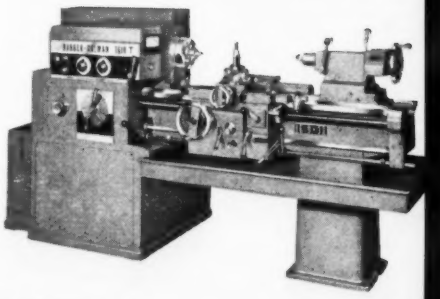
NEW 1610 "specialist" (16½" and 20")—Reduces both capital equipment and operating costs. Class B operators readily become proficient at machining accurate nonthreaded parts. Infinitely variable spindle speeds to 1500 rpm; infinitely variable power feed to both carriage and cross slide; five-position turret-type longitudinal feed stop. Available with hydraulic tracer at only slightly more cost than a standard lathe without tracer.



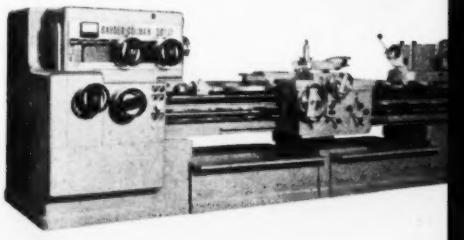
NEW 1307T toolroom lathe (13")—High capacity and timesaving controls combined with super precision. Infinitely variable speeds to 3000 rpm in belt drive can be changed under load. Selected Class ABEC-7 super-precision spindle bearings; ground-from-the-solid actuating screws; antifriction bearings on all shafts; Meehanite castings; hardened-and-ground headstock gears; splined shaft connections. Available with hydraulic tracer.



NEW 1610T toolroom lathe (16½" and 20")—The minute you push the start button and grab the handwheel, you feel the difference toolmakers look for. Try the speed-change dial for fast facing or a light finishing cut on the OD. Smooth, silent, fast acceleration under load—infinitely variable speeds *even while cutting*, to 1500 rpm in the high range. Hydraulic tracer available.



NEW 2013T, 36-speed lathe (21" and 25")—All-new, geared-head precision lathe for high-speed production or toolroom turning . . . used in production shops with throwaway insert tools at speeds to 750 sfm. Tracer control optional. Spindle speeds to 1500 rpm (2000 rpm optional); 66 thread-cutting and feed changes; 500-lb, two-speed tailstock; separate lead screw and feed shaft. New rigidity, new threading features, new accuracy.



Barber-Colman Company

BARBER COLMAN

17 LOOMIS STREET, ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 105

If you need lots of pipe or tube... YODER makes the mills that make it!

For complete information on YODER Pipe or Tube Mills . . . write for the fully illustrated, 88 page YODER Tube Mill Book . . . it is yours for the asking.

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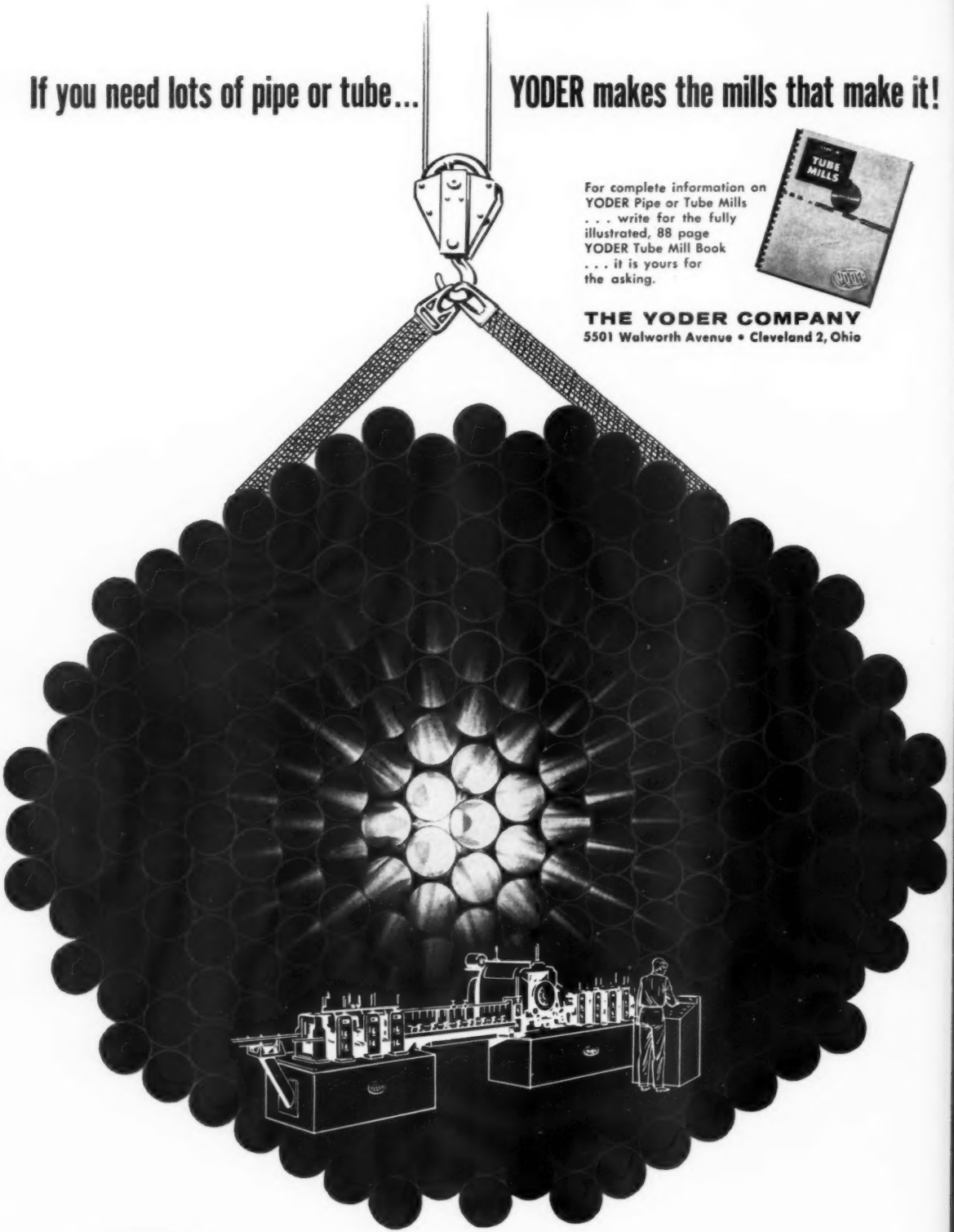

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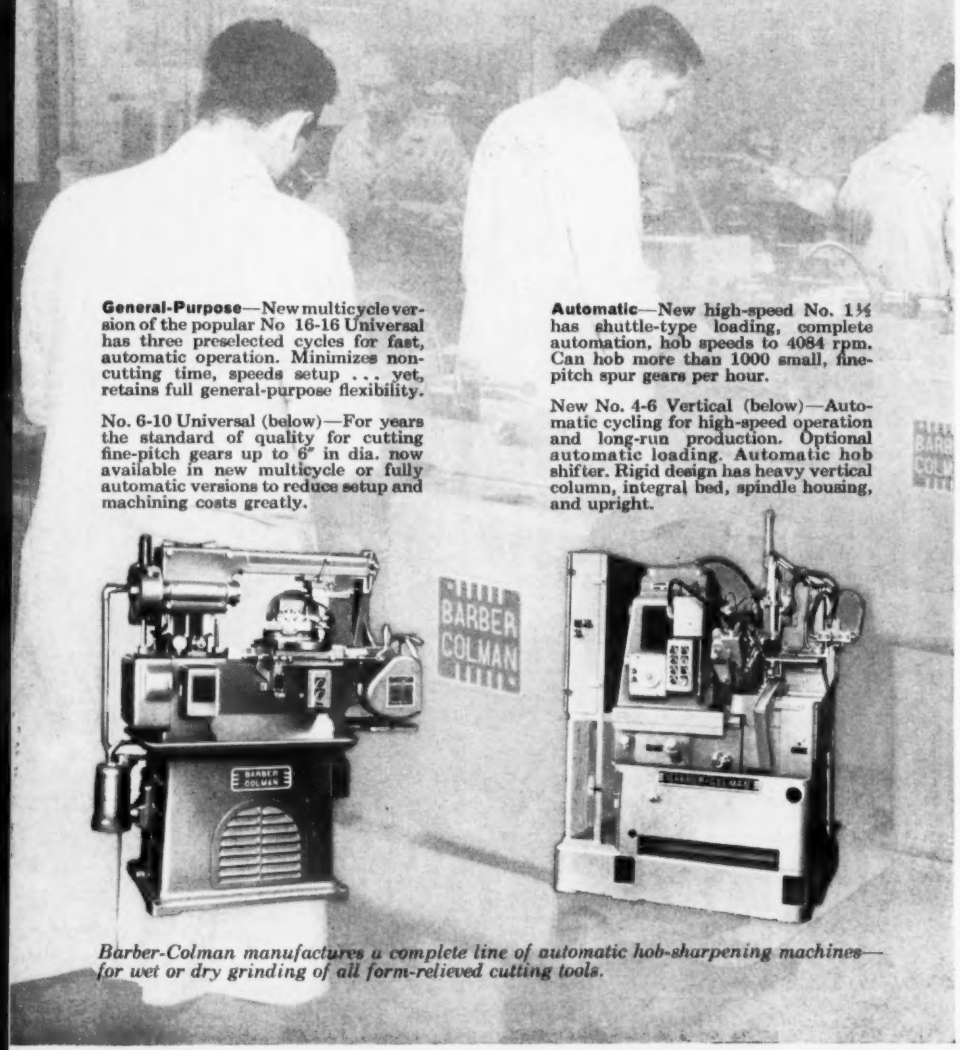
PIPE AND TUBE MILLS (ferrous or non-ferrous)

COLD ROLL FORMING MACHINES

ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 106

Always new ways to save with BARBER-COLMAN Hobbing Machines



General-Purpose—New multicycle version of the popular No 16-16 Universal has three preselected cycles for fast, automatic operation. Minimizes non-cutting time, speeds setup . . . yet, retains full general-purpose flexibility.

No. 6-10 Universal (below)—For years the standard of quality for cutting fine-pitch gears up to 6" in dia. now available in new multicycle or fully automatic versions to reduce setup and machining costs greatly.

Automatic—New high-speed No. 1½ has shuttle-type loading, complete automation, hob speeds to 4084 rpm. Can hob more than 1000 small, fine-pitch spur gears per hour.

New No. 4-6 Vertical (below)—Automatic cycling for high-speed operation and long-run production. Optional automatic loading. Automatic hob shifter. Rigid design has heavy vertical column, integral bed, spindle housing, and upright.

Barber-Colman manufactures a complete line of automatic hob-sharpening machines—for wet or dry grinding of all form-relieved cutting tools.

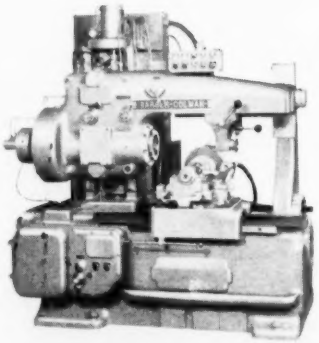
Your assurance of competitive advantage in gear hobbing is Barber-Colman creative engineering. Each of our hobbing machines undergoes continuous improvement. New concepts and features become operational *as soon as they are proven.* You always buy a completely *modern* machine—progressively reduce your costs and upgrade your quality.

Study the machines below for new ideas in hobbing, then contact your Barber-Colman representative. He is listed in the back pages of this directory.

Barber-Colman Company

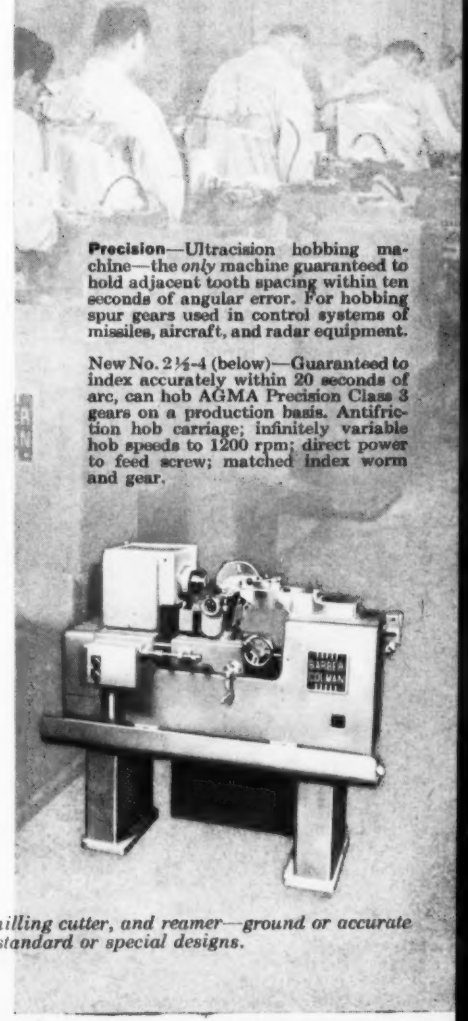
17 LOOMIS STREET, ROCKFORD, ILLINOIS

Heavy-Duty (below)—No 14-15 has fully automatic hydraulic cycle and rigidity for fast, accurate production of coarse-pitch gears and splines. Special 14-15 now available for crown hobbing.



Virtually every type and design of hob, milling cutter, and reamer—ground or accurate unground—available in Barber-Colman standard or special designs.

CIRCLE INFORM-A-GRAM KEY NO. 107



Precision—Ultracision hobbing machine—the *only* machine guaranteed to hold adjacent tooth spacing within ten seconds of angular error. For hobbing spur gears used in control systems of missiles, aircraft, and radar equipment.

New No. 2½-4 (below)—Guaranteed to index accurately within 20 seconds of arc, can hob AGMA Precision Class 3 gears on a production basis. Antifriction hob carriage; infinitely variable hob speeds to 1200 rpm; direct power to feed screw; matched index worm and gear.

How to achieve higher cost-reduction objectives with new bench-type hydraulic Multipress®

By: J. S. Tipton

Multipress Product Manager
Denison Engineering Division
American Brake Shoe Company

Utilizing the inherent smoothness, speed and accuracy of controlled hydraulic power, this new Denison "R-S-T" Series Multipress opens up important new opportunities for cutting production costs on virtually every type of pressing operation. Punching, riveting, assembling, staking, forming, marking and trimming are only a few of the numerous production jobs Multipress can perform faster, more accurately and at lower cost.

The advanced design features described below make this new Multipress a versatile cost-reduction tool on both small lots and high production runs.

Because it is so compact and requires so little space, Multipress is ideal for a continuous line operation where a series of presses is run side-by-side. For automatic operations, Multipress can be mounted around dial tables, feed mechanisms and indexing fixtures to keep tooling costs to a minimum. And controls can be actuated automatically from external sources, making it easy to interlock Multipress with other automated production operations.

CLEAN, COMPACT DESIGN

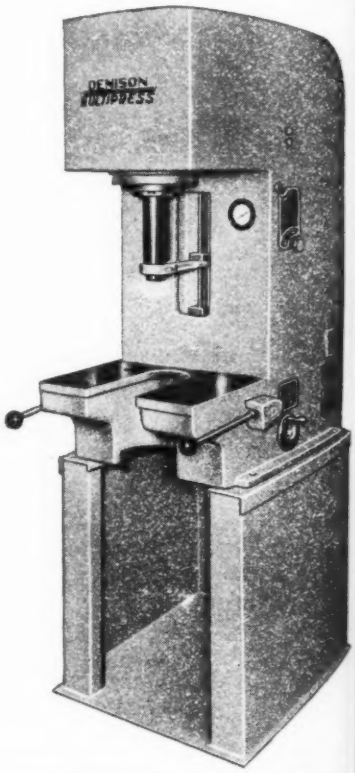
The cutaway illustration on the opposite page shows the basic components of the new Multipress. These include the frame, oil reservoir, hydraulic pump and its electric motor, and the ram-and-cylinder assembly. Note the rugged, extremely simple and compact design.

Briefly, here's how the Multipress operates: The electric motor drives a balanced-vane, cartridge-type hydraulic pump, which draws oil from the reservoir and delivers it under pressure to the ram-action control valve. The valve is actuated when the operator depresses the dual control levers. Oil under pressure flows into the top of the cylinder, forcing the piston and ram down on the work. Ram action is non-rotating, shockless and quiet. When the control levers are raised, oil flows through the lower cylinder port, forcing the piston and ram upward. High-fidelity control of ram speeds, pressures, strokes and ram action is accomplished manually, automatically or electrically by using any one of 18 different operating and basic control valves. The Multipress unit is complete with self-contained piping, control and power circuitry.

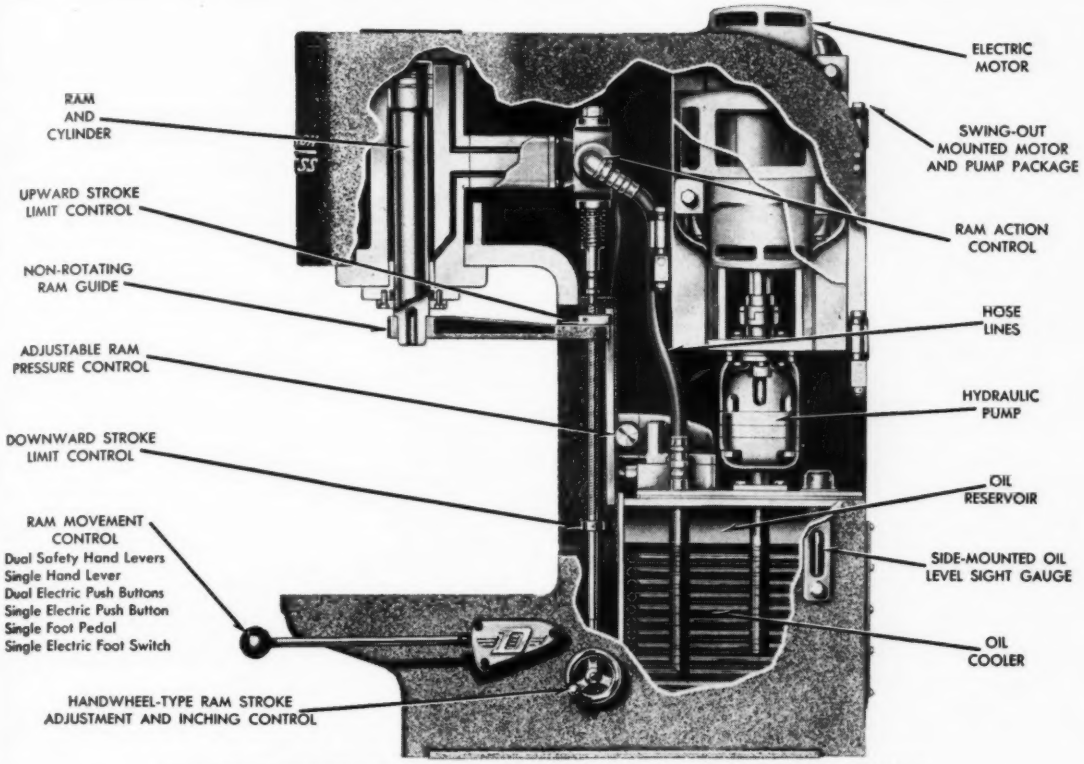
ADVANCED FEATURES

An important consideration in the selection of a Multipress is its *rapid ram approach* feature. The true productive time of a press is only during the actual pressing stroke. Multipress *reduces non-productive time 85%* by increasing the speed of ram approach and ram return. This time-saving allows more cycles-per-minute, more pieces-per-hour—and can result in significantly lower unit production costs.

Another cost-reduction benefit is afforded by faster, simpler tooling and set-up. Greater daylight, larger bed area and throat dimensions provide easy access to tooling. The task



COMPLETELY NEW IN DESIGN. *"R-S-T" Series Multipresses are available in three size and capacity ranges: "R"—1 to 6-tons, "S"—3 to 8-tons, "T"—4 to 12-tons. Unit above is shown mounted on optional bench accessory.*



"R-S-T" SERIES MULTIPRESS CONSTRUCTION AND OPERATING DETAILS

of mounting and setting the press tooling is simplified considerably. The handwheel-type ram stroke adjustment and inching control quickly set the upper limit of the ram stroke, and allow the operator to "inch" the ram to the work under controlled pressure with high accuracy.

SAVES OPERATOR TIME AND WORK

A control knob, conveniently located on the side panel of the press, permits quick adjustment of ram pressure. This arrangement is a great saver of spoiled work and lost time during set-up operations. The operator simply checks the pressure gauge to determine working pressure necessary to accomplish the job. By adjusting the control to that pressure, the ram will travel no further after the work is accomplished. This prevents harmful pressures from being exerted on individual pieces of work even though they may vary in size.

A pushbutton valve for the pressure gauge provides instantaneous check of ram pressure, and keeps the gauge out of the circuit during pressing operations for maximum gauge protection and long life.

BUILT TO J.I.C. STANDARDS

The "R-S-T" Series Multipress is designed to J.I.C. specifications. The swing-out, J.I.C.-mounted motor and pump package make it easy to inspect and service the press. Because the motor and pump are mounted on a single, vertical bracket hinged to the press frame, *quick accessibility to all controls* is possible by simply swinging the complete motor and pump unit out of the frame housing.

The Multipress frame itself is rigid, multi-piece welded steel construction. It is designed and fabricated for .001" deflection per ton.

Both the base and the press bed are recessed to provide more knee room for the operator. All operating and adjustment controls are located "up front" for greater operator efficiency.

In the Denison Multipress design, precision control of ram speeds, ram pressures, ram strokes, ram actions—means tremendous press *versatility* and insures complete uniformity of finished work regardless of variations in work sizes, materials, work positioning or other variables.

A complete line of tailored accessories is available for use with "R-S-T" Series Multipress, including benches, bolsters, index tables, feed mechanisms, touch control and knockout rams.

WRITE FOR FREE CATALOG

Operating data and specifications on the new "R-S-T" Series Multipress, plus information on the complete line of other one to 100-ton capacity Multipress units, are available from your nearby Denison hydraulic press specialist. Call him, or write to us for Bulletin 324 and the new 26-page Catalog 120.

DENISON ENGINEERING DIVISION
American Brake Shoe Company
1197 Dublin Road • Columbus 16, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 109

IT'S A FACT

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DE-STA-CO TOGGLE CLAMPS

Contour checking fixture with De-Sta-Co clamps quickly checks accuracy of parts against master template.

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DETROIT STAMPING COMPANY
340 MIDLAND AVENUE · DETROIT 3, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 110

Leader Recognized

For outstanding service to the contract tool and die industry, Jack Kleinoder, secretary and treasurer of Volkert Stampings, Inc., Queens Village, Long Island, N.Y., was presented the L. A. Sommer Memorial Award by the National Tool, Die & Precision Machining Assn. at its 15th annual convention.

The award, created by the association to honor representatives of member companies who have made outstanding contributions of both time and talent to the industry and the association, was presented to Mr. Kleinoder by John D. Dewhurst, first vice president of the association, and president of Arrow Tool Co., Wethersfield, Conn. The award was made in the form of a perpetual, atmospheric-operated clock inscribed with an appropriate tribute.

Bonding Steel Rule Dies

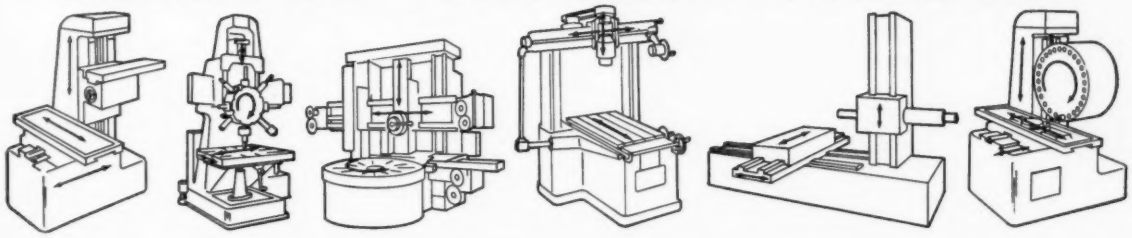
A quick-setting adhesive is doing yoeman service in bonding components for steel-rule dies for Templet Industries, Inc., Brooklyn, N.Y. The firm uses Eastman 910 adhesive to join neoprene strips to the wooden base on the inside of the dies, and to the steel base on the outside of the steel rules.

When the two halves of the die are brought together, the stamped metal blank compresses the ½" thick neoprene "springs." As the dies are separated, the neoprene springs back to its original shape, ejecting the part and scrap.

The high-strength bond is said to take place instantaneously, and to be able to withstand pressures as high as 40 tons through 250,000 stampings.

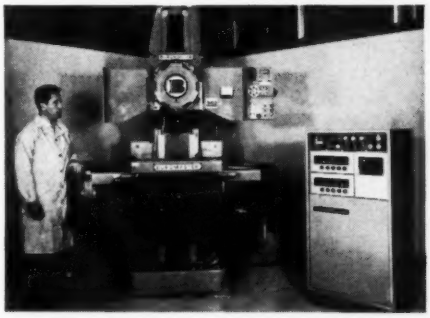
Rheem Electronics

NUMERICAL POSITIONING CONTROLS

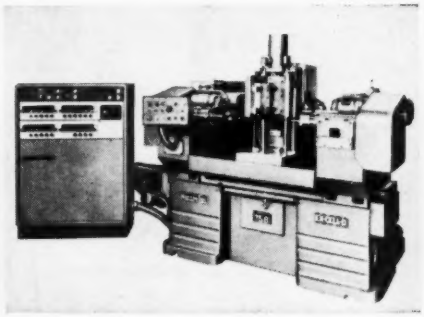


New Features!

Economy
Flexibility
Reliability
Quality
Accuracy



RHEEM Numerical Control shown with Burgmaster 25AHT turret drilling machine.



RHEEM Numerical Control pictured with Excello Model 758 Numera-trol precision boring machine.

This is the advanced automation system that operated so successfully and reliably during the 1960 Machine Tool Exposition in Chicago!

The system represents major advances in the industry in degree of automation attained. For example, it is... *the first system to achieve automatic control of bore diameter while the spindle rotates* and *the first system to distribute tape information electronically, eliminating less reliable stepping and crossbar switches.*

Among the other advantages provided by RHEEM Numerical Positioning Controls are:

MODULAR CONSTRUCTION BY AXES
DIFFERENT RESOLUTIONS AVAILABLE
HIGH POSITIONING SPEEDS
FEED RATE CONTROL AVAILABLE
LARGE TRAVEL DISTANCES
***DECIMAL DISPLAY OF TAPE INFORMATION**
***AUTOMATIC, SEMI-AUTOMATIC, AND MANUAL OPERATION MODES**
VIRTUALLY UNLIMITED AUXILIARY FUNCTIONS

An outstanding example of the versatility provided by RHEEM Numerical Controls is illustrated by the low cost addition of a third axis control to many two-axis systems, e.g. turret drills, drill presses, radial drills, vertical boring machines, etc., all with two-axis positioning tables.

Manual input of dimensional information and decimal display available at no extra cost.

General Control

SPECIFICATIONS

Number of Axes Controllable	5 axes; more by special provision
Travel	Virtually unlimited in all axes
Control Accuracy	±0.0005" for 0.001" Resolution ±0.0001" for 0.0001" Resolution *(all axes if desired)*
Positioning Speed	Limited by resolution only
Tape	1-in. wide, 8-channel Al-Mylar laminate
Tape Reading Speed	100 lines/second
Auxiliary Functions	Virtually unlimited
Feed Rates	Large number available in any or all axes
Operation Modes	Automatic, Semi-Automatic, Manual
Voltage Requirement	117 vac, 60 cps, single phase
Cabinet Size	2 axes or time shared 3 axes, 20"x27"x54" 4 axes, 20"x42"x54"

Please write for complete information TODAY!
Our engineers will be pleased to assist you.

Rheem Controls from 1 to 6 Axes

5200 West 104th Street
Los Angeles 45, Calif.
SPring 6-1800

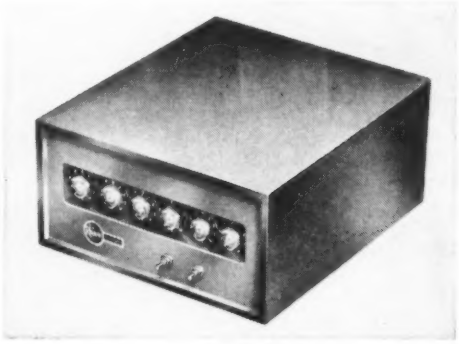
Rheem electronics *A division of Rheem Manufacturing Company*

CIRCLE INFORM-A-GRAM KEY NO. 111

Rheem Electronics

INDUSTRIAL AUTOMATION EQUIPMENT

In addition to the RHEEM ELECTRONICS complete line of Numerical Positioning Controls, the following products are included in the RHEEM line of Industrial Automation Equipment



Rheem Position Display

POSITION DISPLAY

The display unit shown at left has been designed to meet the requirements of operator controlled machines including retrofit on existing machines. The unit provides a continuous display of machine position in decimal form.

The Rheem Position Display is used in conjunction with a position transducer to detect machine slide displacement in increments of .001 inches. The operator may elect to have the absolute position from a zero reference point continuously displayed, or the incremental distance between two coordinate positions. This unit will allow the operator to position the machine more rapidly and with greater accuracy.

The Rheem Position Display is a compact unit occupying less than one cubic foot of space per axis.

SPECIFICATIONS

Tape.....5, 7, & 8 channel tapes, paper or aluminum Mylar types

Reading Speed...100 characters per second — Stop on character. Higher speed models will be announced later.

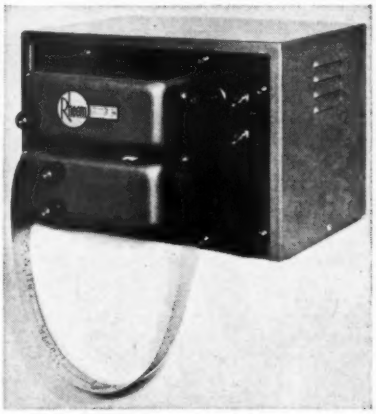
Outputs....8 Information and 1 Timing signal, all appearing simultaneously.
No Hole < 50 μ amps. 0 Volts
Hole 5 ma. —15 Volts

Voltage Requirement.....117 vac 60 cps

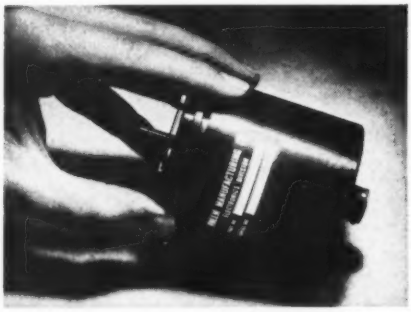
PHOTOCELL READER

RELIABLE
LOW COST
TRANSISTORIZED

The Rheem Photocell Reader is designed to meet the error-free, reliable, rugged requirements of general purpose punched tape reading and machine tool controls. The unit is completely transistorized and uses silicon solar cells as sensing elements.



Reader packaged for Rheem Numerical Positioning Controls. Other configurations available, desk-top or panel mount.



Rheem Position Transducer

POSITION TRANSDUCER
Shaft to Digital Converter

LOW TORQUE LOAD
PRECISION CONSTRUCTION
HIGHLY RELIABLE SENSING ELEMENTS
NO CODED DISCS
NO CONTACT PICKUPS

In this unique device, the sensing elements are two magnetic heads detecting the rotation of the shaft by an impedance change in the head. The head outputs are phased so that external electronics can determine rotation direction and magnitude. The output signals can also be used in a self checking circuit. A third sensing head is included to detect each complete revolution of the transducer shaft. This can be used for accurate zero position when used for linear motion detection.

SPECIFICATIONS

Head Impedance....High — 100 ohms 0.15 mh. @ 300 kc
Low — 80 ohms 0.12 mh. @ 300 kc
Typical Bridge Input.....300 kc — 28 volts rms
Typical Bridge Output...Low — 0 volts
High — 5 volts p-p
Resolution....500 increments/revolution
Weight.....1.5 lbs. approx.
Size.....2.50 in. diameter
3.00 in. length (body)
4.00 in. length (overall)
Shaft Length.....9/16 in.
Shaft Dia.....0.250 in.
Inertia.....0.3 oz.-in.^{2}

NOTE: Transistor or Vacuum Tube drive and detector units are also available.

Please write for complete information TODAY!
Our engineers will be pleased to assist you.

Rheem electronics *A division of Rheem Manufacturing Company*

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CIRCLE INFORM-A-GRAM KEY NO. 112

Engineers Need Creativity

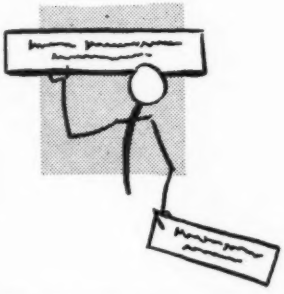
Engineering education must do more to stimulate creativity and imagination, Dr. Robert D. Stout, dean of the Graduate School at Lehigh University, said at the 75th anniversary banquet of Tau Beta Pi, national engineering honor society.

In discussing demands on higher education, Dr. Stout said, "We need not worry about the numbers of engineers available so much as about their creativity." He pointed out that engineering activities "must be kept in perspective with society's needs and activities.

"The scientist may or may not provide the concepts required," said Dean Stout, "but unless engineers can translate them to working designs we will have to do without them. The scientist and engineer must maintain the power to communicate."

He called for "a blend of disciplines" in engineering education, and urged integration of curricula — "courses to pull together the packets of knowledge for engineering usefulness."

Skinner Precision Industries, Inc.



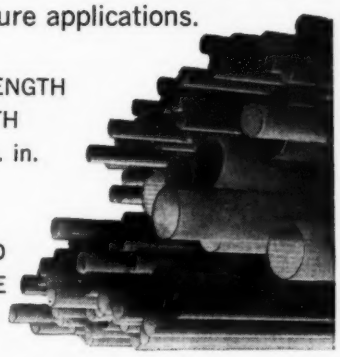
The Skinner Chuck Co., New Britain, Conn., changed its name to Skinner Precision Industries, Inc. Paul Rogers, President, says the reason for the change is to broaden the scope of the corporation's present and future activities. Additional activities include the manufacture and sale of products not necessarily related to chucks. It was felt that the name Skinner Precision Industries, Inc., more clearly indicates the new products and services offered.

TUFF-TUBE

FIBERGLASS-EPOXY STRUCTURAL TUBING

Ideal for spacers, racks, mandrels, frames, jigs, and hundreds of other tooling and fixture applications.

* 25,000 psi TENSILE STRENGTH
* 20,000 psi COMPRESSIVE STRENGTH
* LIGHTWEIGHT, only .06 lbs./cu. in.
* CORROSION & RUST PROOF
* SMOOTH SURFACES
* EASILY, ACCURATELY MACHINED
* TOUGH, ANTI-WEAR LAMINATE
* RESISTS HIGH TEMPERATURES



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SIZE	PRICE per LINEAR FOOT WITH QUANTITY DISCOUNTS			
I.D. x O.D.	1—499 ft.	500—999 ft.	1000—1999 ft.	2000 ft. & up
.500 x .550	.56	.52	.48	.44
.512 x .562	.56	.52	.48	.44
.884 x .950	.67	.62	.58	.53
.905 x .950	.67	.62	.58	.53
.920 x 1.000	.68	.63	.59	.54
1.000 x 1.093	.70	.65	.60	.55
1.250 x 1.344	.99	.92	.85	.78
2.662 x 2.750	1.65	1.53	1.41	1.30

PLUS MANY OTHER ODD LOTS IN SIZES FROM ¼" to 9" DIA.

SPECIAL!
Filament wound super-high strength cylinders. ⅛" wall, 9" dia., 1 ft. long.

$6.50 each (less in quantity)

LAMTEX

LAMTEX INDUSTRIES, INC.
Motor Ave. Farmingdale, L. I., N. Y.

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WHEN REQUESTING QUOTATIONS ALWAYS MENTION QUANTITIES

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-76-80-90
1	48-56-60-64-80-90
2	48-52-54-56-60-72-80-96
3	36-40-60-64-72-80
4	30-32-38-42-44-56-60-64-72-80-90
5	22-27-30-32-36-38-42-48-50-56-60-64-72-80
6	24-28-30-36-38-42-44-48-56-60-64-72-80
7	28-30-32-34-36-38-40-44-48-64
8	24-26-28-30-38-40-44-48-56-60-64-72-80
9	24-28-30-32-36-40
10	18-20-22-26-28-30-34-36-40-48-56-60-64-72-80-96
11	20-22-26-27-30-32-36-40
12	20-22-26-27-30-32-36-38-40-48-56-60-64-72-80
13	20-22-24-28-32-40
14	14-16-18-26-28-30-32-36-40-64
15	18-20-24-28-32-40
16	16-18-20-22-24-28-32-36
17	16-20
18	16-18-20-24-32-40
19	18-20
20	14-16-18-20-24-32
22	16-18-20-24
24	14-16-18-22-24
26	14-16-20-24
28	14-16-20
30	14-16-20
1/16	56-60-64-72
5/64	56-60-64-72
3/32	32-36-38-48-50-56-60-64
.100	100
.107	52
7/64	36-40-42-44-48-50-56
1/8	30-32-36-38-40-48-56-60-80
.132	50
9/64	30-32-38-40
.148	38
5/32	24-26-28-30-32-36-38-40-50
11/64	24-26-30-32-36-38-40
3/16	12-18-20-22-24-26-27-28-30-32-36-40
3/16	30-32-36-40-48-56-64-72
.198	24
13/64	24-28-30-32-36-40
7/32	20-22-24-26-27-28-30-32-36-38-40-56-60-64-72
.227	24
15/64	20-22-24-28-32-36-.246-40
.246	40
1/4	10-12-14-16-18-22-23-24
	25-26-27-30-32-36-38-40-48-50-56-60-64-72-80
17/64	12-18-20-24-27-28-32-40
.277	40
9/32	16-18-20-24-26-27-28-32-36-40-46-56
19/64	18-24
.300	28
5/16	10-12-14-16-20-22-26-27-28-30-32-36-40-44-48-50-56-64
21/64	16-18-20-24-36
11/32	16-18-20-22-24-26-27-28-32-36-40-64
23/64	16-24
.365	28
3/8	10-12-14-18-20-22-26-27-28-30-32-36-40-44-48-56-64-72
25/64	14-16-18-20-24-27-32-40-48
.402	24
13/32	12-14-16-18-20-24-27-28-32-36-40
27/64	14-20-24-28-32-36
7/16	10-12-16-18-22-24-26-27-28-30-32-36-40-48-56
29/64	12-14-16-20
15/32	12-14-18-20-24-27-28-32-36-40
31/64	13-20-24-32
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41/64	11-18-24-32
21/32	10-11-18-20-24-27-32-40-48 32
.664	
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23/32	11-12-16-18-20-24-27-32-36-40
47/64	10-12-16-18-20
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.800	16
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.835	16
55/64	6-12
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.850	14
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1-3/64	12-14-16-18-20
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1-11/64	18
1-3/16	7-8-10-12-14-16-18-20-24-27-28-32-40
1-1/4	8-10-14-16-18-20-24-27-28-32-40
1-5/16	6-7-8-10-12-14-16-18-20-24-27-28-32-40-48
1-3/8	5-8-10-14-16-18-20-24-27-28-32-40
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1.767	18
1.7715	12
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3-1/8	4-8-10-12-14-16-20
3-3/16	4-8-10-12-14-16-20
3-1/4	4-8-10-11-12-14-16-18-20
3-3/8	4-8-10-12-16
3-1/2	4-8-10-12-16
3-5/8	4-8-10-12-16
3-3/4	4-8-10-12-16
3-7/8	4-8-10-12-16
4	4-6-8-10-12-16
4-1/8	4-8-10-12-16
4-1/4	4-8-10-12-16

Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

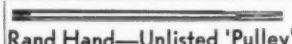
'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.002, .003, .005
MACHINE SCREW	#6 to #14	Plus or Minus	.003, .005, .010
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010, .015, 1/64, 1/32

Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NF	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 NF
11/16	11 NS, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF



Rand Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24-NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16 NF
5/16	24-NF	Also Larger Sizes	NC & NF

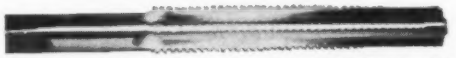
UNLISTED Right Hand "Pipe" Taps

"NPT" Taper	"NPT" Thread	"NPS" Size	"NPS" Thread	EX. LENGTH "NPT" & "NPS" Size	EX. LENGTH "NPT" & "NPS" Thread
1/16	27	1/16	27	1/16	27
1/4	27	1/8	27	1/8	27
2-1/2	8	1-1/4	11½	1/4	18
3	8	1-1/2	11½	3/8	18
3-1/2	8	2	11½	1/2	14
4	8	2-1/2	8	3/4	14
Also British		3	8	1	11½
		3-1/2	8	Also British	
		4	8		
		Also British			

Lefthand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/16	27	1	11½
1/8	27	1-1/4	11½
1/4	18	1-1/2	11½
3/8	18	2	11½
1/2	14	2-1/2	8
3/4	14	3	8
Also British		3-1/2	8
		Also British	

ACME TAPS IN STOCK



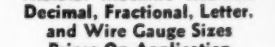
IF NOT IN STOCK—7 to 10 DAYS DELIVERY—When ordering or requesting quotations, kindly furnish following information:

(a) Kind of material being machined.
(b) Depth of hole in inches, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machined stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with blue print.

SPECIAL REAMERS

Immediate Delivery

H.S.S.S. Machine Reamers Decimal, Fractional, Letter, and Wire Gauge Sizes Prices On Application



SPECIAL—Right Hand High Speed "EXTRA LENGTH DRILLS" "AND LEFT HAND DRILLS" In Stock for Immediate Delivery

Get all 3 . . .
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- ☑ QUALITY
- ☑ PRICE

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FIELD TOOL SUPPLY CO.

Industrial Cutting Tools

31 S. DESPLAINES ST., CHICAGO 6, ILL.

All Phones: Financial 6-1195

The Largest Stock of SPECIAL and STANDARD TAPS, DIES, PLUG GAGES

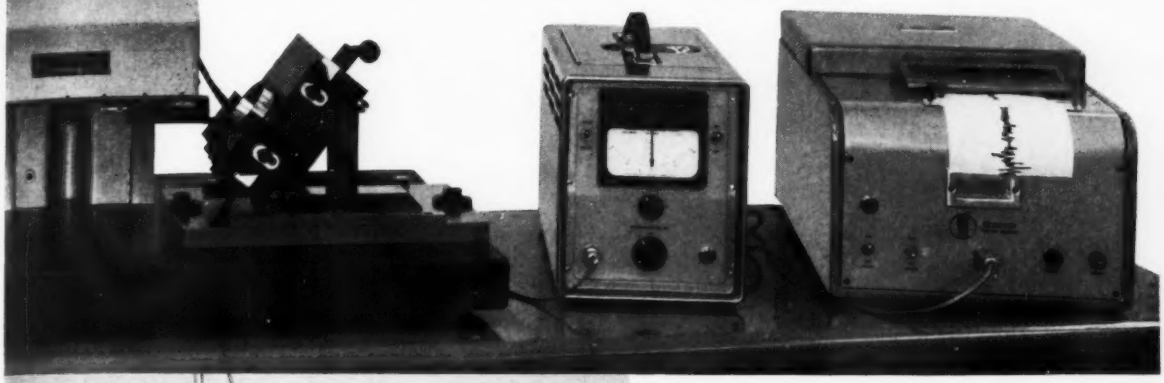
CIRCLE INFORM-A-GRAM KEY NO. 114

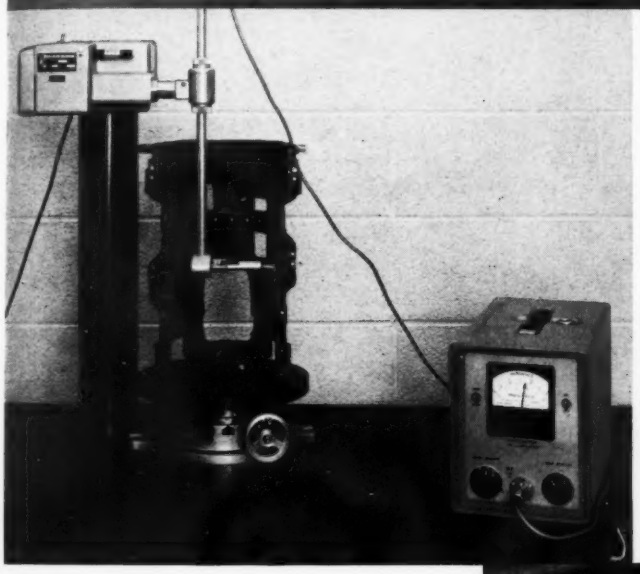
BREAKING MEASUREMENT BARRIERS WITH MICROMETRICAL

HOW TO SEE A SHAPE IN MILLIONTHS

To assure desired quality, a manufacturer needed to production-check the crown of tapered roller bearing components in millionths of an inch. Electronic indicators proved inadequate; so they came to Micrometrical. The result is the Microcorder® setup shown.

With the work positioned on a sine plate, a positive-displacement Tracer moves across the raceway, and a recorder draws a magnified profile of the surface. Each ¼" division on the chart represents a vertical distance of .000100" or .000025", as desired; so the contour is readily scaled in millionths. The equipment is used in the grinding room—for checking bearing cups, cones and rollers. BULLETIN LT40 gives details. Write for it!





FOR BOOM WITHOUT BUST—

In the Vulcan aircraft cannon, an internal cylindrical cam surface is critical to performance; and the manufacturer has to measure the roughness of this surface at many places. To do so quickly and easily, he uses the Profilometer® setup at left. This includes (1) a standard Linear Pilotor mechanism on an extra-high column; (2) a special Tracer (at bottom of vertical tube) that positions itself to all slopes of the cam; and (3) a standard Amplimeter, which shows the roughness height in microinches (arithmetical or RMS average). Ask for BULLETIN LT41.

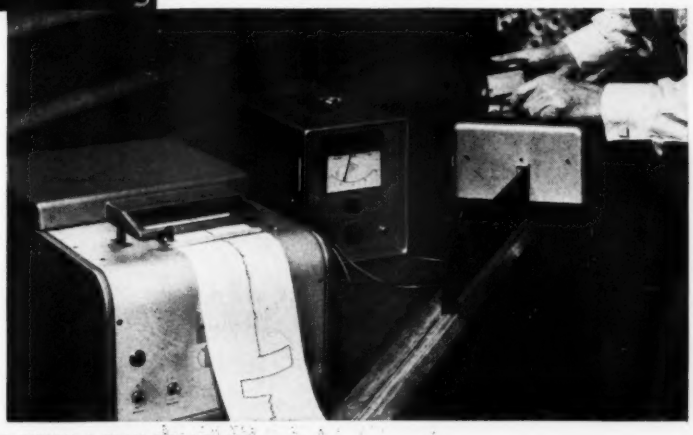
Bring YOUR surface measurement problems to

MICROMETRICAL MANUFACTURING COMPANY
3621 S. STATE RD. ANN ARBOR 6, MICHIGAN

Manufacturer of the PROFILOMETER® • PROFICORDER® • MICROCORDER® WAVOMETER® • ANDEROMETER® • VAROMETER®

SELF-PROPELLED THICKNESS CHECKER

The Microcorder® equipment at right is filling a steel mill's need for rapid edge-to-edge thickness checking of rolled steel. A self-propelled Pilotor with built-in Tracer moves along a sample strip, while a recorder draws a continuous chart that shows the size, shape and location of variations from nominal thickness. This is much faster, more accurate and more complete than previous methods—takes only 60 to 90 seconds for a 96" strip—and permits a 60% reduction in rejects caused by ridges. BULLETIN LT42 gives details. May we send you a copy?



CIRCLE INFORM-A-GRAM KEY NO. 115

NEW BUCKEYE AIR GRINDER FOR PRECISE GRINDING...

NOW ONLY $88.50 complete kit

KIT INCLUDES: 1—14G air grinder, 3—nose pieces, 3—grinding points, 1—8' hose and couplings, 1—dressing stone, 3—Wrenches, 1—Vitalizer (air filter and lubricator), 1—plastic case.

Compare these Buckeye-quality features with any grinder in its class.

- COMPACT, WELL BALANCED, only 3⅞" long and 13/16" dia.
- LIGHTWEIGHT, only 5 oz.
- INFINITE SPEED CONTROL, RING THROTTLE, 0 to 50,000 RPM.
- CAPACITY, ½" mounted points.
- RUGGED CONSTRUCTION, one-piece all steel motor housing, large precision ball bearings supporting one-piece spindle.
- STURDY VANE-TYPE AIR MOTOR delivers maximum power with minimum air volume.
- QUIET OPERATION at all speeds.
- 1/8" or 3/32" collets.

Recommended working air pressure 90-100 P.S.I.

AVAILABLE AS COMPLETE KIT (illustrated) 14G-830—$88.50; COMPLETE KIT (less vitalizer) 14G-820—$67.50; GRINDER with 3 nose pieces and 2 collet wrenches only, 14G-810—$60.00.

ORDER DIRECT FROM FACTORY OR CONTACT YOUR LOCAL BUCKEYE REPRESENTATIVE TODAY!

Buckeye Tools CORPORATION

P. O. BOX 966 DAYTON 1, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 116

Maintenance & Engineering Show

Speakers from a broad cross section of industry will address the 1961 Plant Maintenance & Engineering Conference in Chicago, Ill. Jan. 23-26, held in conjunction with the Plant Maintenance & Engineering Show at the International Amphitheatre. Morning sessions will take place at the Amphitheatre, and evening sessions at the Palmer House. Both show and conference are produced by Clapp & Poliak, Inc., New York exposition management firm.

Conference topics this year are balanced to include both the managerial and technical aspects of maintenance. Special "problem sessions" have been arranged for automotive, chemical, electronic equipment, textile, cement, metalworking and metal fabricating, paper, petroleum processing, food processing, research and development and steel plants.

The show will be one of the largest ever held with an exhibit area of more than six acres.

Information about conference registration, instructions for sending advance "problems" to "problem sessions," rapid registration cards for the show and hotel information may be obtained by writing Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y.

Ex-Cell-O Wins First Place

Ex-Cell-O has been selected as first place award winner for the best annual report of the machine tool industry for 1959. For this achievement a bronze "Oscar of Industry" trophy was presented to E. J. Giblin, Ex-Cell-O Treasurer on Monday evening, October 24, 1960, at an awards banquet in the grand ballroom of the Statler Hilton Hotel in New York City.

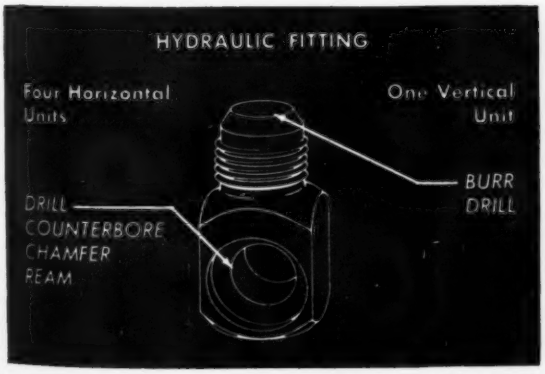
Close to 5000 reports were reviewed in 96 categories during the 1960 competition sponsored by FINANCIAL WORLD. This is the sixth first place award Ex-Cell-O has received.

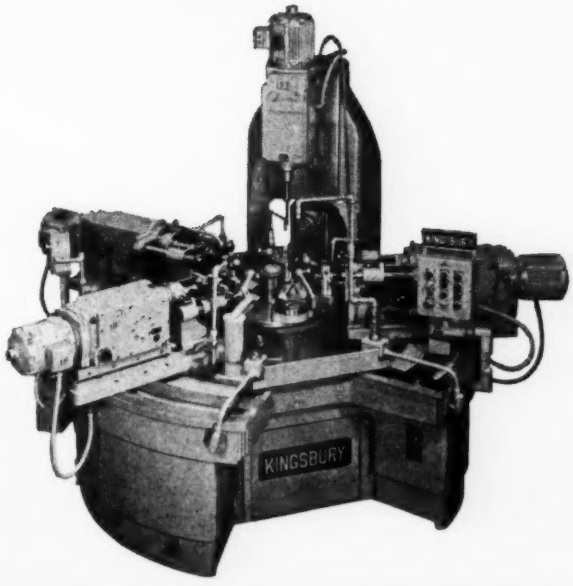
This one Kingsbury works on these seven different parts

This Kingsbury machine is fairly simple — just five units and six stations. The work pieces are held in two-jaw chucks with interchangeable locating jaws and clamps. The gross production rate for five parts is 500 parts per hour. On the sixth part it is 340, and on the seventh part with two chuckings it is 250 per hour.

Normally our machines are far more complex than this. But this one does show that our simpler machines also pay off. With good basic design and rugged accurate construction, they have little downtime. And uniform, accurate cycles produce little scrap.

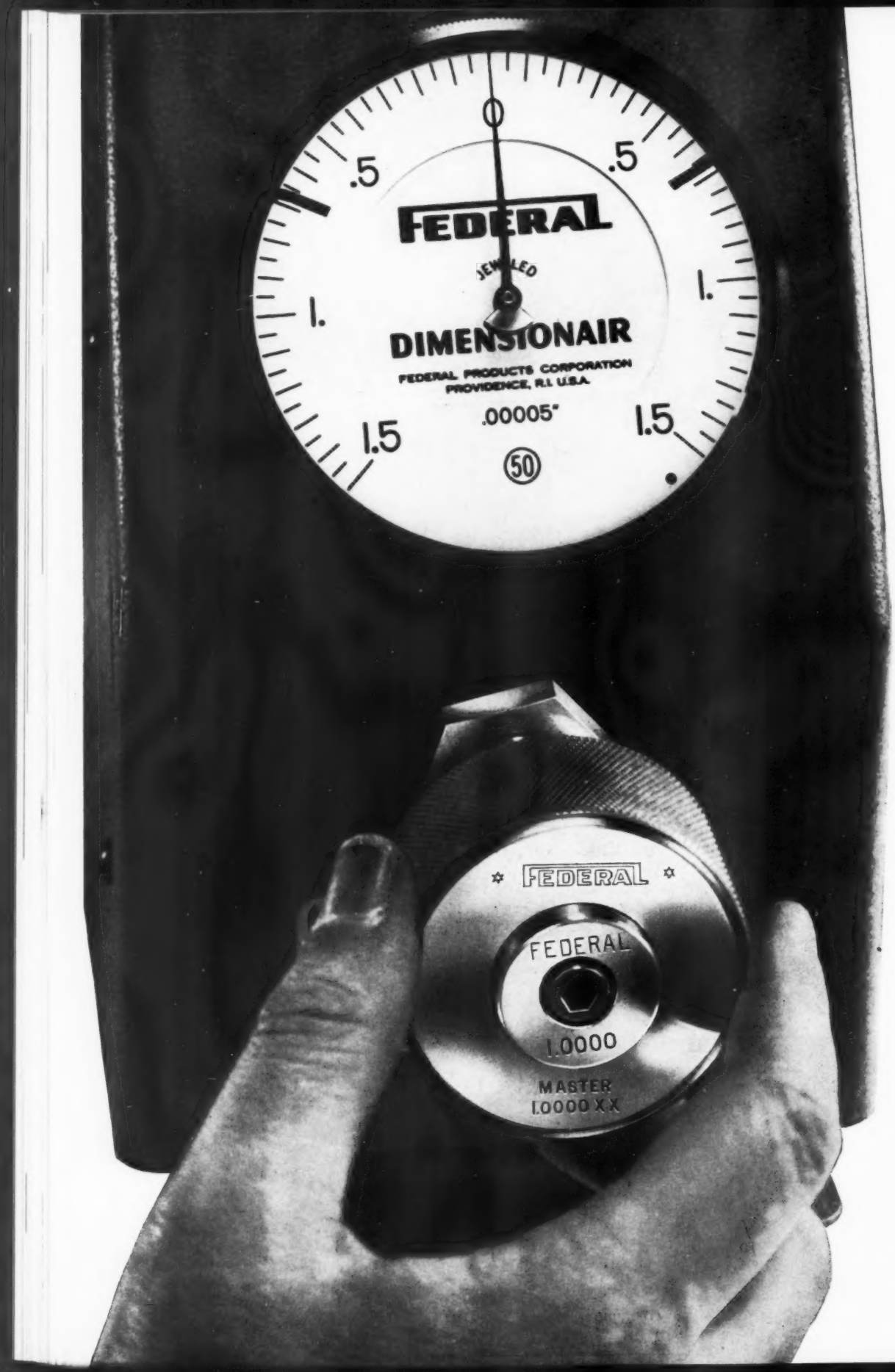
May we quote you on a job, either simple or complex? Kingsbury Machine Tool Corp., Keene, New Hampshire.





KINGSBURY MULTI-UNIT AUTOMATICS

CIRCLE INFORM-A-GRAM KEY NO. 117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NO DOUBT ABOUT IT

. . . that's why the

DIMENSIONAIR

is the best air gage you can buy!

No doubt about the Dimensionair's readings

Such sharply defined calibration — the mark of a truly accurate gage — obviously gives you greater resolution, much finer readings than broadly defined graduations and wide hands or air-suspended markers ever can. Each time you gage with the Dimensionair, the needle-thin indicating hand advances smoothly, comes to a positive stop, yet is responsive to the slightest change. Its position in relation to the fine-line graduations is unmistakable. Such decisiveness, coupled with Dimensionair sensitivity, means much greater readability. In fact, tests prove that you get more information from the Dimensionair than from other air gages having *twice* the magnification.

No doubt that the Dimensionair maintains its accuracy

Dimensionair magnification is built-in . . . fixed. No adjustment can change it. That's why the Dimensionair, once set, *stays* set. Air pressure variations cannot affect the accuracy of the Dimensionair. Its balanced air circuit cancels them out, This achieves a stability which cannot be approached by other air gages.

No doubt the Dimensionair is easiest to use

Its fixed magnification and protection against drift guarantees *linear, calibrated* accuracy so you need only *one* master for set up . . . make only *one* adjustment to set zero. You're ready to gage in less than ten seconds! Dimensionair design gives you wide range operation (up to .006" depending on model selected)*. You also get greater plug clearance and more deeply recessed gaging jets for faster, easier gaging and longer life than is possible with other air gages.

All these advantages are based on the fact that the Dimensionair, unlike other air gages, is *built* to a specific accuracy and magnification. This is an important difference, as thousands of Dimensionair users can tell you. But don't just take our word for it . . . see for yourself. We will be glad to demonstrate the Dimensionair to you, either by itself or against any other air gage. We have offices all over the country. There's a Dimensionair near you, ready to be demonstrated.

FEDERAL PRODUCTS CORPORATION
1231 Eddy Street • Providence 1, R. I.

*FIVE MAGNIFICATIONS TO CHOOSE FROM:
1,250:1 (.006" range, each grad. = .0001")
2,500:1 (.003" range, each grad. = .00005")
5,000:1 (.0015" range, each grad. = .00002")
10,000:1 (.0006" range, each grad. = .00001")
20,000:1 (.0003" range, each grad. = .000005")

Yours for the asking!
"DIMENSIONAL GAGING WITH AIR"

A truly educational film — 16 mm, 40 minute, color — outlines the basic principles of air gaging — shows applications. Surely a must for engineers who must apply air gaging, or for anyone who is responsible for dimensional control. Puts the value of air gaging in the proper perspective. Write for reservation.

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FOR RECOMMENDATIONS IN MODERN GAGES . . .

l Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 119

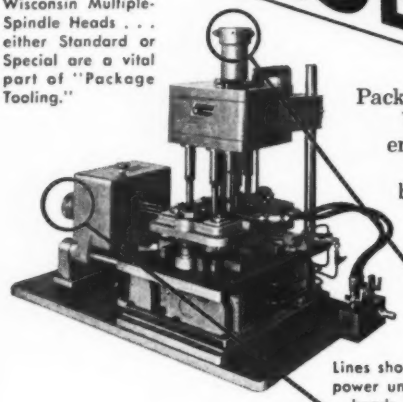
Catalogs and other helpful literature

The Automatic Chucking turret lathes equipped with "FeeDial" are described in Gisholt Machine Co.'s 22-page Bulletin 1179-B. The "Fastermatic" lathes allow preselection of feeds and machine functions. Circle Inform-A-Gram No. C1 for a free copy.

Two New Brochures come from Fellows Gear Shaper Co. Circle Inform-A-Gram No. C2 for one describing their 3″ fine pitch gear shaper, and mark Inform-A-Gram No. C3 for the brochure devoted to the Fellows-Pfauter P400 hobbing machine.

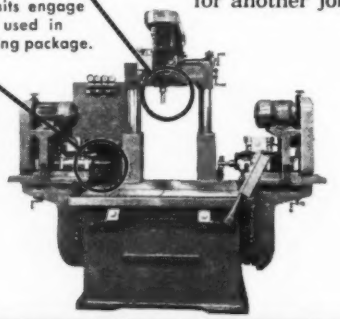
ONE
Wis-Matic does the jobs of
SEVERAL special machines
thanks to . . .
PACKAGE TOOLING

Wisconsin Multiple-Spindle Heads . . . either Standard or Special are a vital part of "Package Tooling."



Package Tooling . . . as developed by Wisconsin for the WIS-MATIC . . . enables this machine to do a variety of drilling, tapping, reaming and boring jobs *in a single* work cycle. Each "package" . . . a complete unit mounted to a base plate, and equipped with multiple-spindle heads . . . may be quickly, securely and accurately replaced by a similar "package" for another job.

Lines show where power units engage heads used in tooling package.



Wis-Matic Machines are available with any combination of *one vertical* and *two, three or four horizontal* power units. As many "Tooling Packages" as required are built for each machine.

Write for Bulletin No. 560

WISCONSIN DRILL HEAD CO.

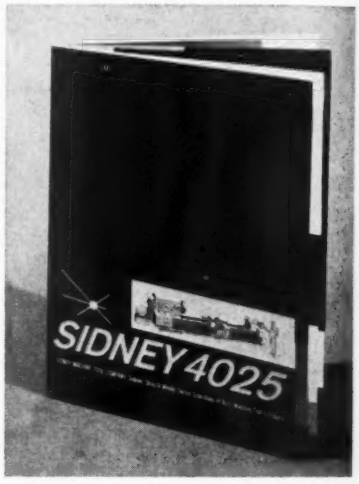
4975 NORTH 124th ST. • BUTLER, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 120

Multiple Spindles for production nut setting are the topic of a new publication from Gardner-Denver Co. It covers units to meet torque requirements topping 200 ft-lbs. Circle Inform-A-Gram No. C4.

Data on Standard, pre-engineered, or custom-designed flexible shafts is contained and illustrated in the Fourth Edition of the S. S. White Flexible Shaft Handbook. It will be sent if you circle Inform-A-Gram No. C5.

The Model 4025 extra heavy duty engine lathe made by Sidney Machine Tool Co. is detailed in a 12-page bulletin published by the company. Get a copy by circling Inform-A-Gram No. C6.



Eight Comprehensive Pages of information on power presses that cut off roll-formed shapes on the fly are contained in a new technical manual published by Federal Press Co. It's free if you circle Inform-A-Gram No. C7.

"Vibratory Barrel Finishing Machines" is the title of a new brochure published by Syntron Co. It describes the company's models for deburring, deflashing, grinding, descaling, polishing, burnishing or drying of unfinished parts. Circle Inform-A-Gram No. C8.

Bulletin 61A details the variety of coolant tank units manufactured by The Ruthman Machinery Co. It's free if you circle Inform-A-Gram No. C9.

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CIRCLE INFORM-A-GRAM KEY NO. 121

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Any misalignment in the machine may be easily corrected by the aligning feature built into the hollow mill, these mills eliminate separate holders and shorten tool overhang.

WRITE FOR CATALOG 60-P

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Yes Carr-Lane Jig and Fixture components are better, yet cost less than they could be produced in your shop
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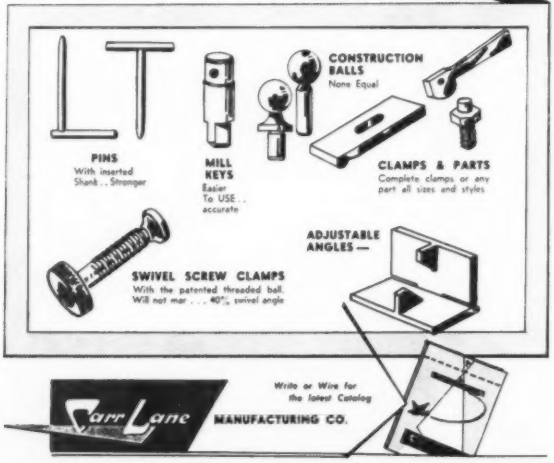
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Complete clamps or any part all sizes and styles
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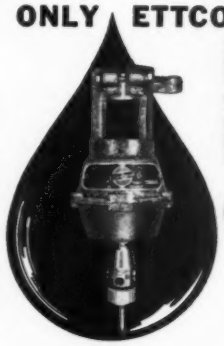

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- Fit any drill press

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CIRCLE INFORM-A-GRAM KEY NO. 1224

Catalogs . . .

Tooling Balls, the hardened, stainless steel variety for making and checking jigs, fixtures and machine setups, are covered in a new bulletin released by Industrial Tectonics, Inc. Circle Inform-A-Gram No. C10 for a free copy.

The Super 30 Fabricator made by Wales Strippit, Inc., is described in the company's Catalog 30S. The unit has a 30" throat depth, and is capable of punching, notching and nibbling. Circle Inform-A-Gram No. C11.

Mechanical Shaft Seals for the rotating shafts of industrial equipment is the subject covered in a brochure which shows authentic installation pictures. Get a copy from Syntron Co., or Circle Inform-A-Gram No. C12.

Putnam High Speed Tools is the name of a 124-page catalog devoted mainly to the 1800 standard sizes and types of end mills made by Putnam Tool Co. It also contains information on the firm's reamers, counterbores, and special purpose tools. Circle Inform-A-Gram No. C13.

The Basic Models of Jones & Lamson optical comparators and measuring machines are described in these new folders from the company:

Model FC-30 and FC-30ER (extended range) — circle Inform-A-Gram No. C14.

Models FC-14 and TC-14 — circle Inform-A-Gram No. C15.

Model TC-10 — circle Inform-A-Gram No. C16.

Model PC-14A — circle Inform-A-Gram No. C17.

The 3R Turret Lathe made by Sheldon Machine Co. is featured in a new bulletin which lists the machine's adaptability to turning, chucking and single point threading work, in addition to standard turret operations. Circle Inform-A-Gram No. C18.

Their line of unitized perforating units for mild steel up to ⅛" thick is covered in Catalog MO-6 published by Tool Products Corp. It's free if you circle Inform-A-Gram No. C19.

Nine Models of Baird Machine Co. ribbon and wire four-slide machines are described in the company's 8-page Catalog 40. The units offer speedy production of stamped and formed parts. Circle Inform-A-Gram No. C20 for a free copy.

Two Publications from Sales Service Mfg. Co. may be helpful. Catalog 760 details Keller Power Hacksaws, and it's yours if you circle Inform-A-Gram No. C21. Form TM860 describes the Tri-Matic oscillating belt grinder and sheet surfacer. Circle Inform-A-Gram No. C22 for it.

Basic Information on swaging is contained in a 16-page booklet compiled by Fenn Mfg. Co. Get a free copy by circling Inform-A-Gram No. C23.

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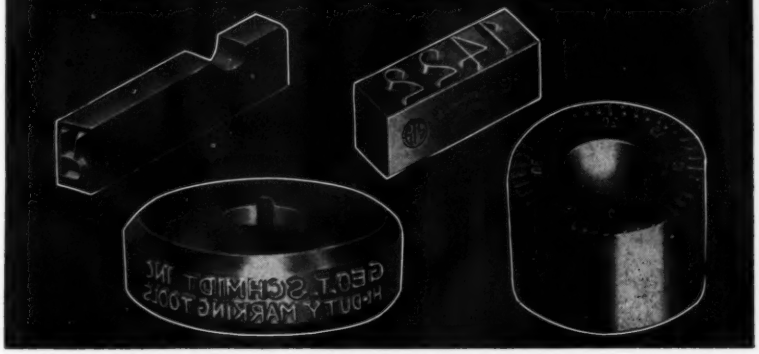

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Expertly Designed "HOLE HOG" Machine Tools for–

- *Greater Production*
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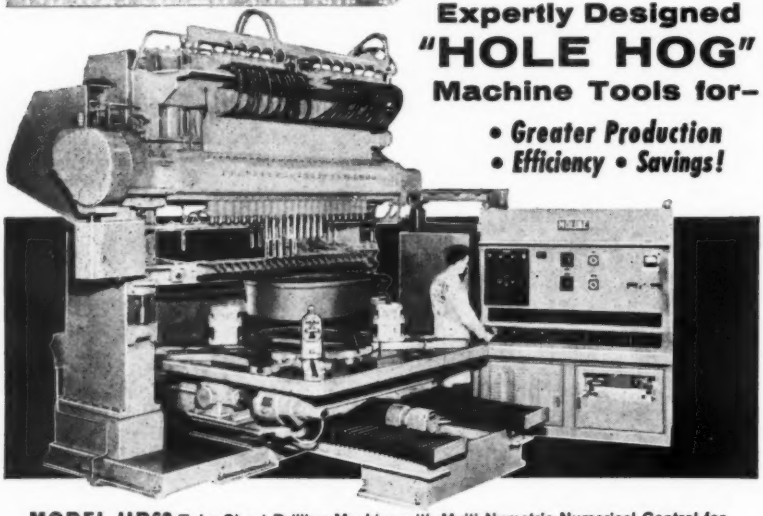

MODEL HD68 Tube Sheet Drilling Machine with Multi-Numetric Numerical Control for positioning of machine table in two directions and for selection of spindles. Information on punched tape permits automatic drilling of a complete hole pattern in a tube sheet without interruption.

60 years of Machine Tool Engineering Experience is at your service for——

- Multi-Spindle Boring
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- Special Multiple Operation Machine Tools

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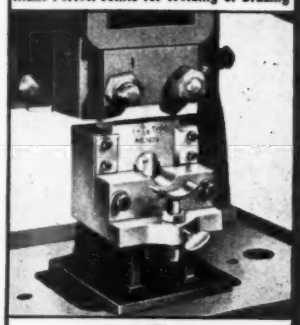
Make Perfect Joints for Welding or Brazing



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OUR 23RD YEAR

CIRCLE INFORM-A-GRAM KEY NO. 1244

Catalogs . . .

"Progress in Red Ring Gear Inspection" is the name of a bulletin put out by National Broach and Machine Co. It carries data on the firm's automatic gear checkers, classifiers, and an involute profile checking machine for gear shaving cutters. Circle C24.

Taps are the topic of a new catalog and price list offered by Regal Div., Beloit Tool Corp. Circle inform-A-Gram No. C25.

Kwiklok Quick Change toolholders, adapters and associated tools are the topic of a new 90-page catalog from Falcon Tool Co. Circle Inform-A-Gram No. C26 for a free copy.

Abrasive Wheel Dressing with a new traverse dressing tool is the topic of a bulletin issued by Sidley Diamond Tool Co. The unit is an electronically-controlled, power-driven circular wheel. Circle Inform-A-Gram No. C27.

The Bryant Symons precision diamond tool lathe available from Milo Mfg. Co. is described in Milo's technical bulletin. It illustrates typical applications of the unit. Get the bulletin by circling Inform-A-Gram No. C28.

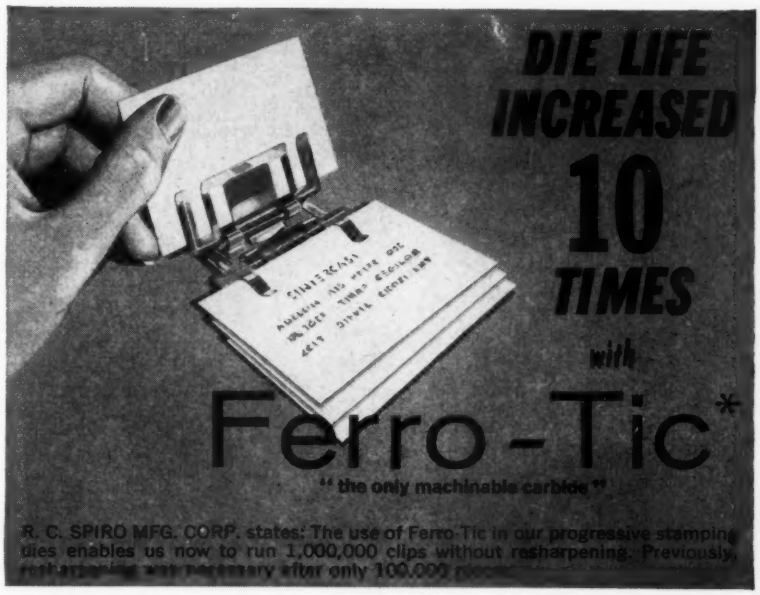
Bulletin PB 111 is devoted to the portable, Mercil-type plating barrels made by Hanson-Van Winkle Munning Co. Ask for it by circling Inform-A-Gram No. C29.

Cold Roll Formed Products form the body of a new information folder available from Solar Steel Corp. They'll send it free if you cle Inform-A-Gram No. C30.

A Descriptive Folder dealing with the 1960 edition of the Steel Castings Handbook is available from the Steel Founders' Society of America. The Handbook is 680 pages. The Society will send the descriptive folder free if you circle Inform-A-Gram No. C31.

Quick Selection of the proper model Radicon fan-cooled worm gear reducer is facilitated by the shirt-pocket guide offered free by Foote Bros. Gear & Machine Corp. The "Quick Selector" guide is free if you circle Inform-A-Gram No. C32.

A Wall Chart of conversion factors is available free from Precision Equipment Co. It lists many conversions difficult to locate in reference manuals. Get a copy by circling Inform-A-Gram No. C33.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R. C. SPIRO MFG. CORP. states: The use of Ferro-Tic in our progressive stamping dies enables us now to run 1,000,000 clips without resharpening. Previously,

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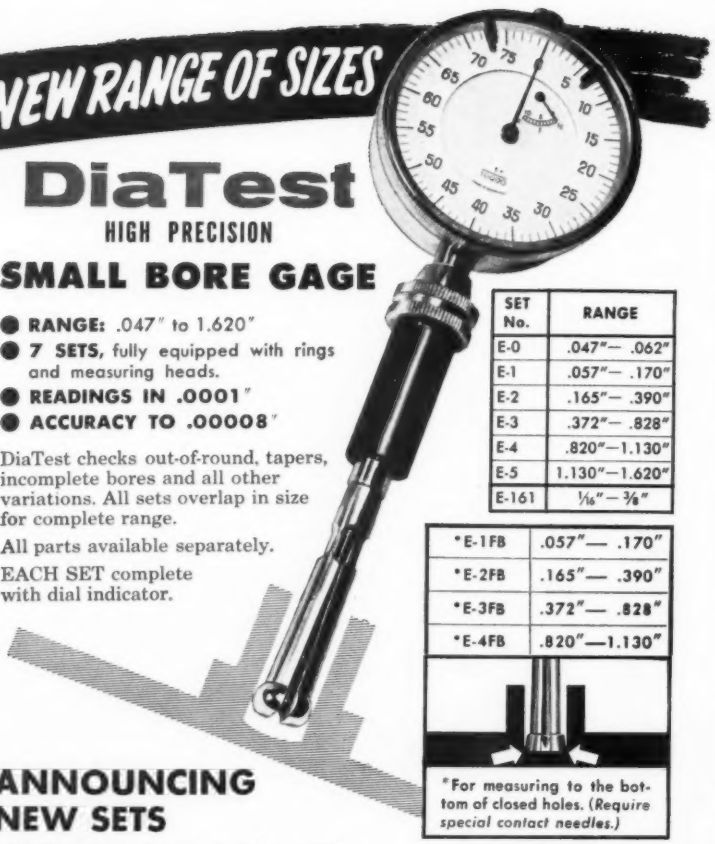
DiaTest checks out-of-round, tapers, incomplete bores and all other variations. All sets overlap in size for complete range.

All parts available separately.

EACH SET complete with dial indicator.



SET No.	RANGE
E-0	.047"— .062"
E-1	.057"— .170"
E-2	.165"— .390"
E-3	.372"— .828"
E-4	.820"—1.130"
E-5	1.130"—1.620"
E-161	1/16"—3/8"

*E-1FB	.057"— .170"
*E-2FB	.165"— .390"
*E-3FB	.372"— .828"
*E-4FB	.820"—1.130"

*For measuring to the bottom of closed holes. (Require special contact needles.)

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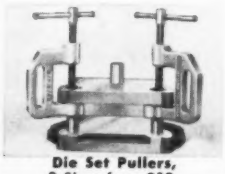

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- **Can be installed in minutes**
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CIRCLE INFORM-A-GRAM KEY NO. 1263

Catalogs . . .

Four-Way Convertible Broaching Machines, the Sundstrand-American variety, are the subject of Sundstrand Machine Tool's new 12-page folder. Capacities of the machines range from 5 to 50 tons. Circle Inform-A-Gram No. C34.

Steelset Diamond Impregnated drills, wheels, blades, dressers, hones and laps are described in 38-page Catalog DG 395 issued by Fish-Schurman Corp. Request a free copy by circling No. C35.

Tungsten Carbide Tools, tool tips, dies, wear parts and Dex-A-Tools are the substance of a new 36-page specification and price list, PL 960, published by Adamas Carbide Corp. Circle No. C36.

A New Concept in hyraulic way type feed units is treated in Buhr Machine Tool Co.'s new brochure. Circle Inform-A-Gram No. C37.

The Profits traceable to planned annual retooling are discussed in a 28-page report published by Ingersoll-Rand Co. Circle Inform-A-Gram No. C38 for a free copy.

The "Squirtmobile," the new trackless carriage for Lincoln Electric Co.'s semi-automatic squirt welder, is described in the firm's Bulletin 5205.2. Circle Inform-A-Gram No. C39 for a free copy.

Standard Fasteners, and special developments in cold headed and screw machine products, are included in a new brochure offered by Federal Screw Works. It's free if you circle No. C40.

Applications for the Lanhyrol thread rolling machines manufactured by Landis Machine Co. are set forth in the company's 20-page Bulletin LHY-10. Request it by circling Inform-A-Gram No. C41.

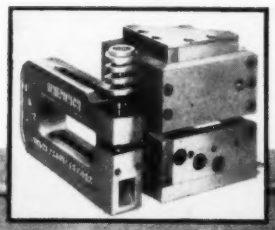
The Magna-Eye, an attachment which magnifies and illuminates vernier scales on a range of equipment from jig borers to radial drills, is the subject of a new circular from Stebar Co. Circle Inform-A-Gram No. C42 for a copy.

The Engineering Applications for Selectron high speed selective plating are set forth in an 8-page brochure that also lists plating equipment, techniques and results achieved with the method. Circle Inform-A-Gram No. C43 for a free copy of the Selectrons, Ltd., publication.

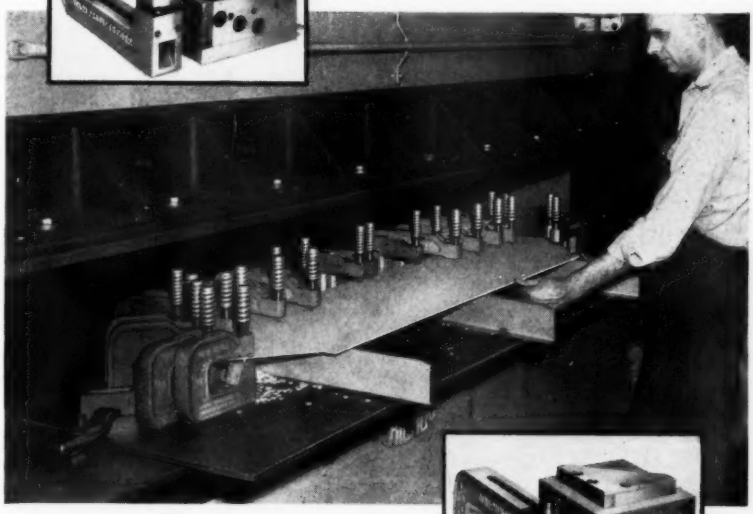
A New Line of machinery check valves is featured in new literature distributed by Parker-Hannifin Corp. Request it by circling Inform-A-Gram No. C44.

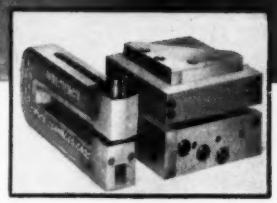
Standardization for punch sizes is the topic of Dayton Perforators, Inc.'s new catalog listing the company's Proven Usage Punch Sizes. Get it by circling Inform-A-Gram No. C45.

Fasteners made of eight alloys are the subject of Chase Brass & Copper Co.'s new catalog. It lists a complete line of bolts and nuts, cap and machine screws, washers, cotter pins, nails, tacks, rivets, etc. Circle Inform-A-Gram No. C46.



UNIPUNCH SERIES "A" Hole Punching Units punch round and shaped holes up to 3" in diameter in up to ¼" mild steel (Series "AH" for up to ½" thick). Notching Units for corner, edge, vee and special shaped notches may be used in combination setups with hole punching units. Both types of Series "A" Units have popular standard 8⅛" shut height and 3½" die height.





UNIPUNCH SERIES "B" Hole Punching Units punch round and shaped holes up to 3½" in diameter in up to ⅜" thick mild steel or equivalent. Standard or special Series "B" Notching Units may be used in combination setups. Both types of Series "B" Units have popular standard 5½" shut height and 2 19/32" die height.

How UNIPUNCH Hole Punching and Notching UNITS save time and cut costs

Unipunch Tooling System produces custom setups with standard units. Simply set up the units outside the press according to the desired hole punching and notching pattern; slide onto press bed; and start producing parts with first stroke of ram — *nothing attached to press ram.*

Unipunch self-contained Units permanently align punches and dies — *no adjustment or aligning.* These Units may be used and re-used in innumerable setups — *no "dead" unproductive storage.* Various mounting methods permit Unipunch Units to be used in presses or press brakes — *no special capital equipment required for production of parts.*

For complete information on punching and notching sheet metal, plates, angles, channels, extrusions

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PUNCH PRODUCTS Corporation

374 Babcock Street, Buffalo 6, New York

CIRCLE INFORM-A-GRAM KEY NO. 127

Catalogs . . .

Latest Developments in Ther-Monic induction heating equipment are contained in a 52-page catalog-handbook issued by Induction Heating Corp. It's free if you circle Inform-A-Gram No. C47.

"Rotary Automation" is the title of Baird Machine Co.'s Catalog 10 which describes the firm's automatic six and eight spindle chucking machine. Circle Inform-A-Gram No. C48.

Metal Stamping Equipment is the concern of a 42-page catalog, No. NA100, published by Numberall Stamp and Tool Co. Circle Inform-A-Gram No. C49 for a free copy.

Precision Automation Machines designed for high speed automatic fabricating, finishing, assembling, indexing and packaging uses, are the subject of a free brochure published by Sylvania Lighting Products Div., Sylvania Electric Products Inc. Circle Inform-A-Gram No. C50.

NOW! for the FIRST time HYDRAULIC FEED on a 10" x 16" grinder

LOW COST Micro-Precision, High Speed Grinding

No. 17H Priced at only $3580.00 to give you the operating ease and high speed of hydraulic feed for little more than the cost of a hand feed grinder.

For precision surface grinding on tool room or production jobs, you can't beat the Covel No. 17H. The large grinding wheel with plenty of direct power *plus* high speed hydraulic feed and big cross-feed capacity make it a real money saver. *Grinds approximately twice as fast as with a comparable hand feed machine.*

***First* with hard chrome table ways . . .** Preserve original accuracy of hand-scraped V and Flat tableways. Available at extra cost on all Covel Surface Grinders.

Micro-Precision a Covel Tradition-Since 1874

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

Write, wire or call us TODAY. We'll gladly show you what the Covel 17H can do for you. Ask for Bulletin TP-11.

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The Mag-Mill, a vertical milling machine featuring a built-in magnetic table, is described in Bulletin MM60 issued by Hanchett Magna-Lock Corp. They'll send it free if you circle Inform-A-Gram No. C51.

Sliding Bolsters that reduce die changing time on inclinable and straight side presses are described in a new bulletin published by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N.Y. Request a copy by circling Inform-A-Gram No. C52.

Two New Technical Board Reports are available at 50 cents each from the National Fluid Power Assn. One is titled "Glossary of Terms for Fluid Power, Second Edition—1960," and the other is "Dimension Identification Code for Fluid Power Cylinders." Write the Association at 5595 N. Hollywood Ave., Milwaukee 17, Wis., for quantity prices. C53.

Sheet Metal Machinery, punches and dies are the subject of Catalog 161, an 84-pager published by Ward Machinery Co. It also includes various tables of information useful in sheet metal work. Circle Inform-A-Gram No. C54.

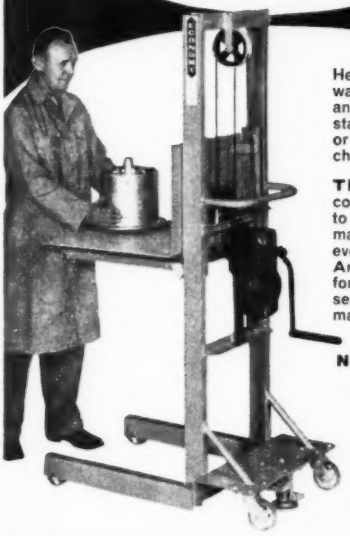
Self-Centering Bore Gages are covered in Mahr Gage Co.'s new folder. These instruments use comparator gaging heads that read directly in 0.000020, 0.000050 or 0.0005. Get a free copy by circling Inform-A-Gram No. C55.

Bulletin S-100 describes the cold-headed metal fasteners made by John Hassall, Inc. They'll send a free copy is you circle Inform-A-Gram No. C56.

Continuous Horizontal Surface, and vertical broaching machines get the attention in a new bulletin published by Foote-Burt Co. Circle Inform-A-Gram No. C57.

The Oxweld CM-56 cutting machine is the topic of a new booklet published by Linde Co. The machine reproduces metal parts from pencil sketches on ordinary paper. Circle Inform-A-Gram No. C58 for a free copy of the booklet.

Every shop needs a Shoplifter



Here is the economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working level.

The Shoplifter is a compact, portable, easy to operate, lifter that will make the job easier for every man in your shop. And . . . it is quality built for years of dependable service with minimum maintenance.

New MARK II Shoplifter has a capacity of 750 lbs., 54" platform lift, full control hoist unit, and complete safety features. Priced at only $195.00 fob Chicago. Order your MARK II now for immediate delivery.

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4 DISTINCTIVE STYLES IN CARBIDE & HSS

SIZES FROM 1/16" UPWARD

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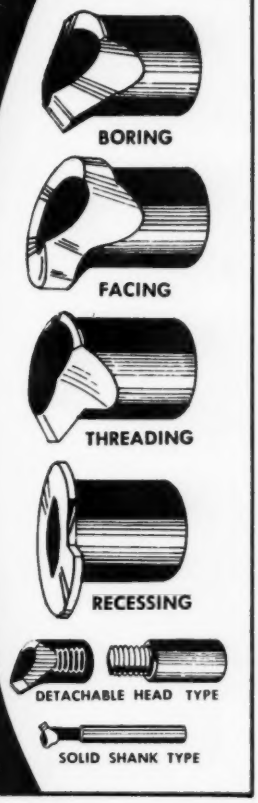

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BOOST PRODUCTION . . .
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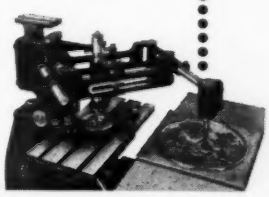
faithful 3-dimensional reproduction
in steel, other metals and plastics

Use the LOW COST precision-built Preis Panto 3D-5 Engraving Machine. Does both 2 and 3 dimensional engraving effortlessly.



- Reversible spindle for enlarging or reducing from a model, die or sample.
- Precision ball bearings throughout.
- Reduction ratio range—1.6:1 to 7:1.
- Four spindle speeds — 7,000 to 18,000 RPM.
- Micrometer adjustment collar.
- Provided complete with floor stand and work tables.

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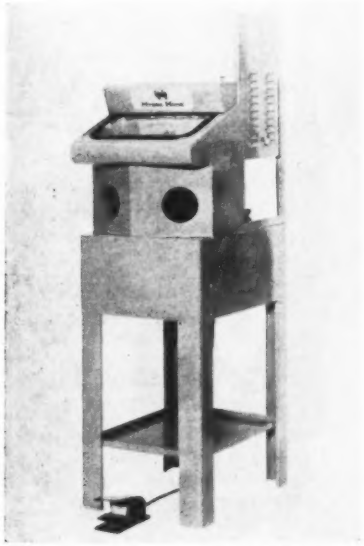
Write for complete details and prices.
For immediate attention write directly to manufacturer below.
Ask for nearest representative.

H. P. PREIS ENGRAVING MACHINE CO.
652 U. S. Highway 22, Hillside, N. J.
CIRCLE INFORM-A-GRAM KEY NO. 1294

Product News

Liquid Blast Machine

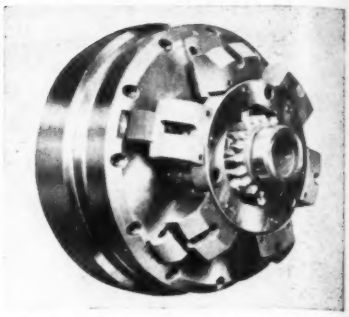
The Model 12 liquid blast machine was designed for tool grinders, heat treaters, platers, brazers, machine shops and electronic shops. Maximum air consumption is just 20 cfm at 100 psi. It has a



40 gpm pump, with 1/3-hp, 110 volt single phase motor. The machine's interior is 13½″ high, 20″ wide; door opening is 13½″ by 10½″. Get additional data from Hydro-Hone Corp., 11055 S. Palmer Ave., South Gate, Calif., or Circle Inform-A-Gram No. P1.

Spring-Jaw Gear Chucks

A new line of spring-jaw gear chucks, either air, drawbar or manually-operated, is offered by Erickson Tool Co., 34350 Solon Rd., Solon, Ohio. The same chuck in this line can often handle pre-shave, pre-grind, finish-shaved, or finish-ground gears, due to the spring-jaw design. Jaws, cages, locating pins and end-stops in the line are all interchangeable.



Chucks are said to give accurate location from all segments, even though an out-of-round condition may have resulted from prior heat-treating or machining. Write the company for details, or Circle Inform-A-Gram No. P3.

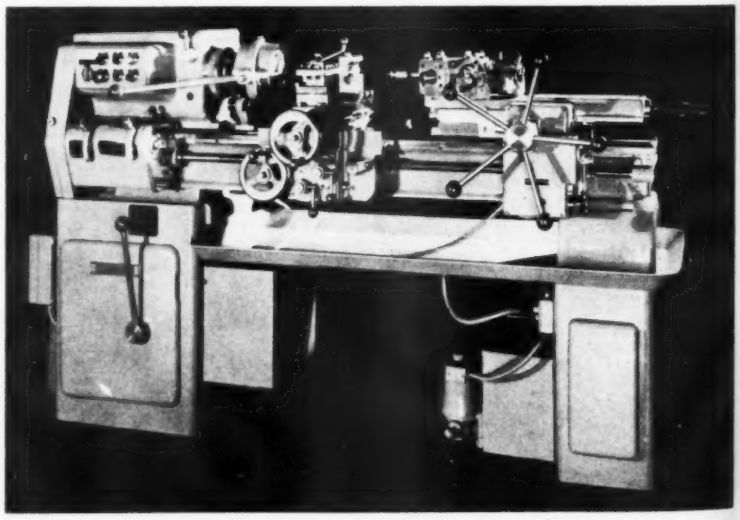
Universal Grinders

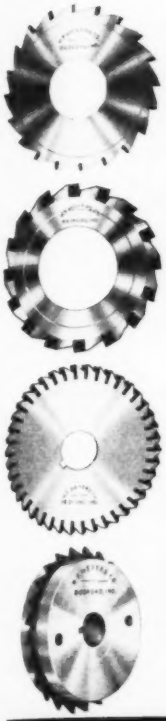
The Tschudin line of Swiss universal grinders is available in three sizes from Alina Corp., 122 E. 2nd St., Mineola, Long Island, N. Y. Infeed on the grinders repeats within 0.000020″, and work spindle runs round within 0.000025″. These fully hydraulic models are said to solve close tolerance problems without the use of electronic equipment, though electronic sizing and mating equipment are available. Ask

Alina Corp. for more data, or Circle Inform-A-Gram No. P4.

Lathe Turns and Threads

This Sheldon 3R turret lathe is equipped for turning between centers and single point threading, as well as standard turret operations. Bar capacity is 1½″, swing over bed ways is 15″ and swing over cross-slide is 8″. These features allow its use as a chucking machine, and also for bar work. Turret travel is 10″, and each turret face is bored to handle 1½″ standard shank tooling. Sixteen standard spindle speeds range from 22 to 1250 rpm. Get further data from Sheldon Machine Co., 4258 N. Knox Ave., Chicago 41, Ill., or Circle Inform-A-Gram No. P2.





Carbide Tipped and Solid Carbide Circular CUTTING TOOLS

MEYERS works to tolerances of .0001″; makes tipped cutters as thin as .030″, solid carbide cutters much thinner; diameters of ¼″ and up.

The finest quality and proper grade of tungsten carbide is engineered to the cutter's job. Tools are precision ground and lapped for long life, tipped to carefully tempered and ground bodies.

• It costs no more to enjoy the production advantages of MEYCO tools: "precision" minded since 1888, careful workmanship, well equipped shops and capable design engineers . . . all add up to plus values for you.

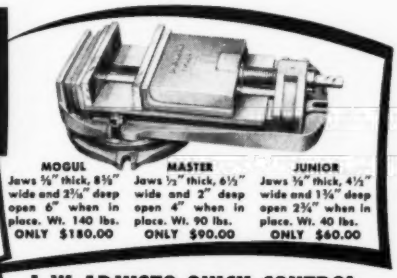
SPECIALISTS—Your special problems in the field of cutting, slitting, slotting, under-cutting or form-cutting are solicited.

Write for New Cutter Catalog No. 51

MEYCO **W. F. MEYERS CO., Inc.**
BEDFORD, INDIANA
A famous name in precision tools since 1888

CIRCLE INFORM-A-GRAM KEY NO. 1311

LW MILLING MACHINE VISES
DRILL PRESS—SHAPER



• Super-Strong • Flange Construction • All surfaces ground for extreme accuracy • Full length bearing on ground bar and machine ways • Steel jaws • Work holding surfaces are always at true right angles, or parallel to the table • Large Acme steel screw with replaceable bronze nut.

MOGUL	MASTER	JUNIOR
Jaws ⅝″ thick, 8⅝″ wide and 2⅝″ deep open 6″ when in place. Wt. 140 lbs.	Jaws ½″ thick, 6½″ wide and 2″ deep open 4″ when in place. Wt. 90 lbs.	Jaws ⅜″ thick, 4½″ wide and 1⅜″ deep open 2¾″ when in place. Wt. 40 lbs.
ONLY $180.00	ONLY $90.00	ONLY $60.00

L-W ADJUSTO-QUICK CONTROL DRILL PRESS VISE AND FIXTURE HOLDER

The first wide range drill press vise that safely handles both rigid and non-rigid work without distortion. Quick action and adjustable pressure at the turn of a knob. Easy hand pressure on hardened and micro-ground bar locks and holds the work.

Precision-built to cut tooling costs and increase production. Heavy removable jaw inserts allow simple, quick adaption for low-cost jigs and fixtures.

		Only
4″ Model	(3½″ Opening)	$31.50
6″ Model	(6¼″ Opening)	$44.00
8″ Model	(8½″ Opening)	$57.00

Available with or without swivel base.

SEE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR OR ORDER DIRECT, GIVING DISTRIBUTOR'S NAME

Adjusto-Quick JIG-LOK

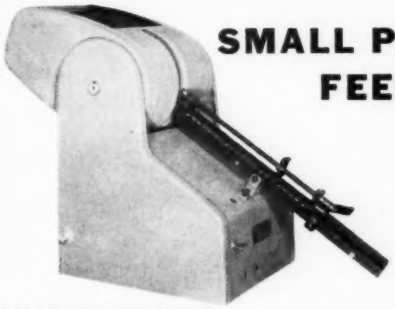
Simplifies jig and fixture design. Pressure adjustment, 1 to 1500 lbs. Easy hand pressure securely holds work without distortion. One inch of the hardened locking bar is soft for easy machining. 4″ x 4″ base, $20.00, 5″ x 5″, $25.00

L-W CHUCK Co. 72 S. ST. CLAIR ST. • TOLEDO 4, O.

CIRCLE INFORM-A-GRAM KEY NO. 1312

HOPPERAL

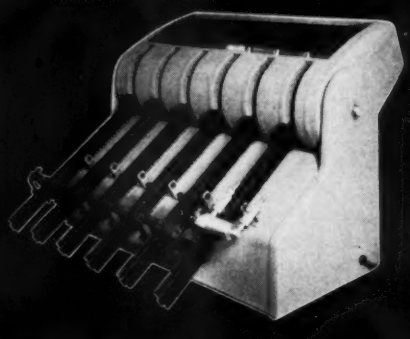
SMALL PARTS FEEDERS



SINGLE TRACK

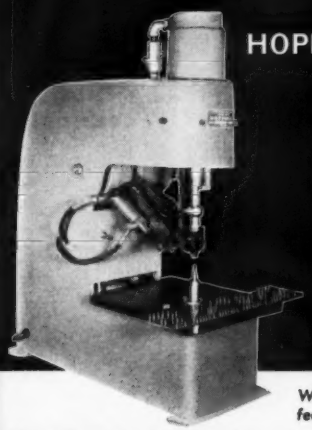
Automates your operation by continuously supplying parts which are properly oriented for machining, assembly and packaging. Gentle oscillating action of "HOPPERAL" assures trouble free feeding of parts. Unit shown has adjustable escapement to release one or more parts at a time.

REDUCE ASSEMBLY COSTS



MULTIPLE TRACK

Available with any number of tracks to feed parts to assemblies or other operations where a large quantity of parts is required simultaneously. Can be partitioned and supplied with properly designed tracks to feed unlike parts.



HOPPERAL DRIVER

A bench press with built-in parts feeder to provide a continuous supply of small parts properly oriented for staking, press fitting, peening and riveting.

The Hopperal parts feeder will feed screws, nuts, bolts, rivets, nails and other fastening devices for many assembly operations.

Write for brochure on automated feeders and assembly machines.

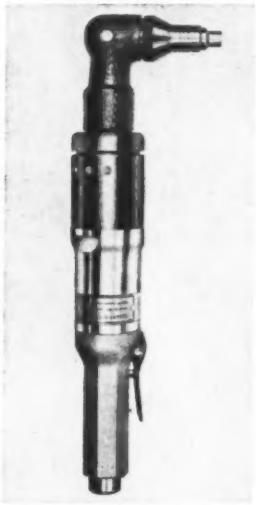
HABERSTUMP-HARRIS, INC.
10463 NORTHLAWN AVENUE • DETROIT 4, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1313

Product News

Angle Screw Driver

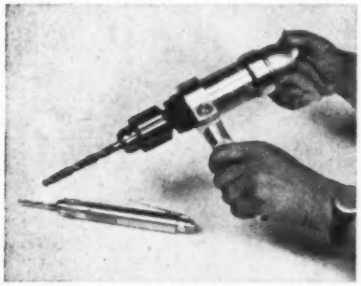
This new air-motor driven angle screw driver adapts to any type screw through a variety of bits and finders. Standard right hand rotation, or reverse rotation, is



available. A standard muffler lessens noise. Most models, plus attachments, weigh less than 4½ lbs. Request more data from Gardner-Denver Co., Quincy, Ill., or Circle Inform-A-Gram No. P5.

Pneumatic Drill Line

A variety of 30 Desoutter air drills, including miniature, angle, close corner, 360°, 90°, 30°, twin spindle, rack feed, straight and pistol grip units is offered by Newage Industries, Inc., 222 York Rd., Jenkintown, Pa. The 10½-oz



miniature model has a ⅛" capacity, but is no bigger than a cigar. The small diameters of the straight drills enables them to be grouped closely — down to 2" centers. Write the company, for details, or circle Inform-A-Gram No. P6.

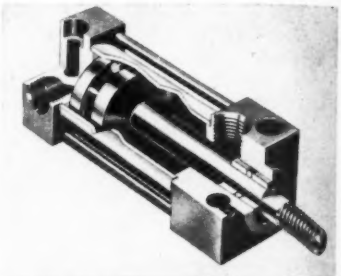
Die Protection

Electronic die protectors for punch presses have been developed by Clark Controller Co., 1146 E. 152nd St., Cleveland 10, Ohio. With these photoelectric, impact or RF Coil type units, the press won't recycle unless part is ejected from previous cycle. They

can be used with any size automatic or manually fed press with any type electrically - operated clutch, as long as part reaches the pickup when it's still possible to stop the press's next stroke. Get further data from the firm, or Circle Inform-A-Gram No. P7.

Small, Sturdy Cylinder

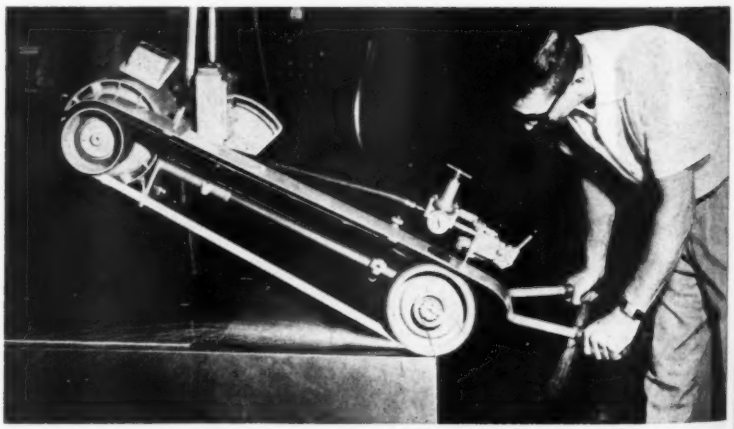
This 200 psi air cylinder, the square head Series S Midget-Air model, is for small force applications calling for compactness and mounting versatility. It's offered in ¾", 1", and 1⅛" bore sizes with standard strokes ranging to 12" in double-acting models. The one-piece piston and stainless steel rod are brazed together to prevent loosening during operation. "O"-ring seals assure dependable service at all working pressures. Write



to Hannifin Co., Dept. 164, 501 S. Wolf Rd., Des Plaines, Ill., for more information, or circle Inform-A-Gram No. P8.

Medium Duty Belt Grinder

This medium duty model has a 90" long abrasive belt with an 8" contact wheel. Its compact size suits it for use where space is a problem, though it can handle most grinding jobs. There is air tensioning of the belt. Standard accessories available adapt it for use as a floor stand unit, swing frame grinder, or lathe-mounted cylinder grinder or polisher. Ask for Bulletin 116 from Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind., or Circle Inform-A-Gram No. P9.



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Used by many to re-condition Electrodes without removing from machines—

Down-time is Slashed!

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Designed to fit most all popular Electrode Dresser power tools.

Special shapes quickly made up.

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Severance TOOL INDUSTRIES INC.
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SAGINAW, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1331

heinrich Grip-Master

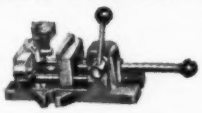
THE ORIGINAL SCREWLESS DRILL PRESS VISE

POSITIVE LOCKING GUARANTEED

Some models have sides precision ground square with jaws for machining from 2 or 3 sides. Jaw widths 3", 4", 6" and 8" . . . from 3" to 9" openings.

CUT TOOLING COSTS UP TO 75%

Use the HEINRICH Grip-Master Jig and Fixture Base. Simply add false jaws and bushing plate.



Result . . . an accurate, low-cost Drill Jig.

Send for BIG, FREE 28-page catalog.

HEINRICH TOOLS, INC., DEPT. 131-A
Racine, Wisconsin

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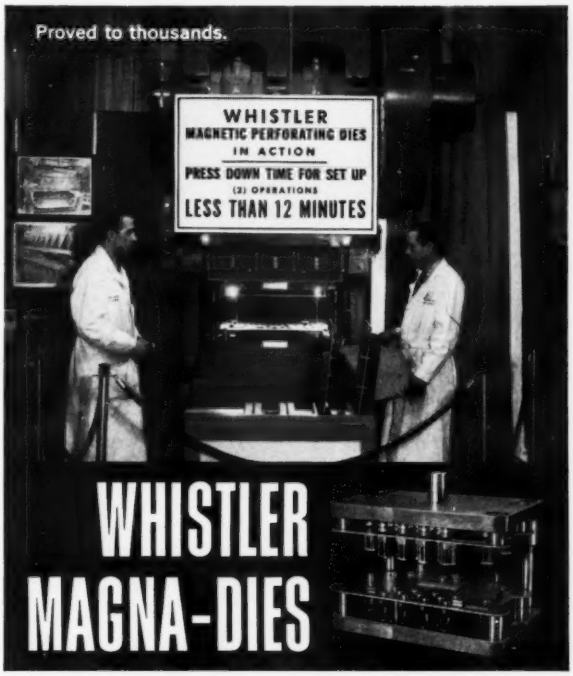
faster changeovers boost press production



Whistler Magnetic Perforating Dies feature interchangeable parts fastened to steel templates which are patterned to the stamping. Punches and dies are assembled and disassembled in templates on an assembly bench while the presses are working on other production.

- **REDUCE DIE COSTS:** In one plant, over 1500 operations (for parts up to 3' x 5') have been tooled up at an average cost of $200 each.
- **EXTEND PUNCH AND DIE LIFE**
- **SAVE STORAGE SPACE**
- **ELIMINATE DELIVERY DELAYS:** Punches and dies stocked in .001" increments from .100" to .500" diameters. Other sizes in stock up to 3".

GET THE TIME AND MONEY SAVING STORY ON WHISTLER PRODUCTS:
magnetic dies • adjustable dies • custom dies

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

mail the following:
- ☐ Magna-Die Catalog
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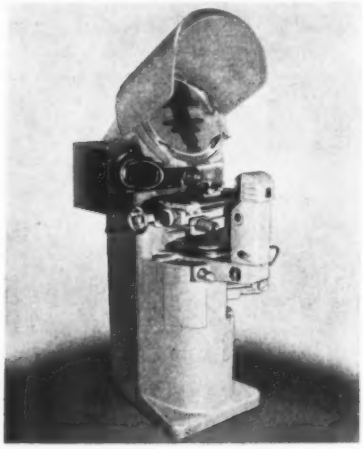
- ☐ Custom Die Bulletin

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1333

Product News

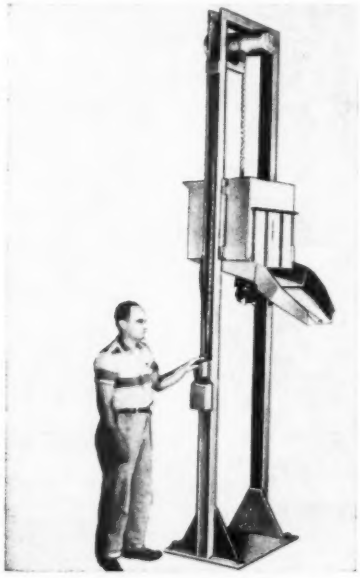
"Compact" Comparator



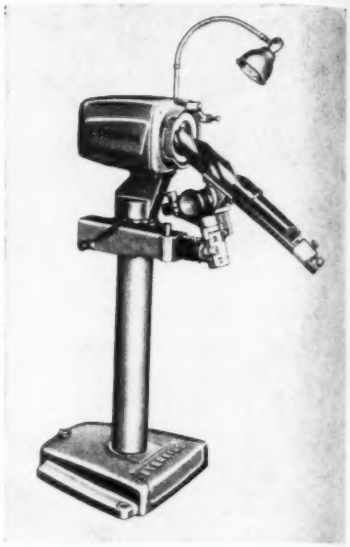
Lateral, vertical and angle measuring capabilities are incorporated into this 14″ screen comparator. It's called Model PC-14A, and offers direct reading measurements to 0.0001″, high-intensity fan-cooled illuminating units, projection lenses from 5X to 125X, three table styles, and work capacity of either 5″ or 8″ dia, with a maximum of 24″ between centers. More information is available from Jones & Lamson Machine Co., Springfield, Vt., or Circle Inform-A-Gram No. P10.

Hopper Elevator

These hopper elevators in four sizes, 3, 5, 7, or 10 cu in capacities, aid in loading the bowls of parts feeders or other automatic parts processing systems. An electromagnetic vibrator keeps the parts moving freely out of the hopper and over the chute. There are no belts, clutches or other wear-vulnerable moving parts. Supporting structure handles heights in the 10′ to 20′ range. Ask for a bulletin on the elevator from Syntron Co., 341 Lexington Ave., Homer City, Pa., or Circle Inform-A-Gram No. P11.

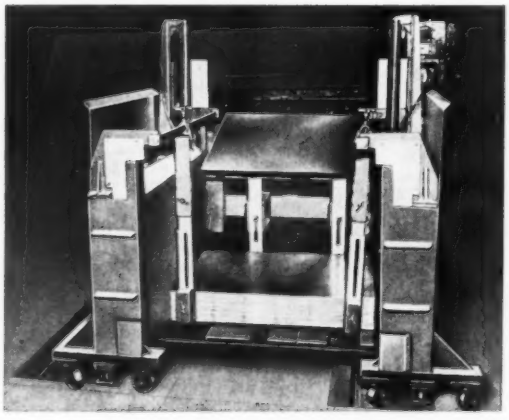


Drill Grinder



Grinding 59° drills accurately with a free cutting conical form on all sizes from ⅛″ to 2½″ is simplified by the new Model DF Sterling drill grinder made by McDonough Mfg. Co., Eau Claire, Wis. No chucks or collets are needed. Locating the drill at the cutting edge of the lip being ground produces an accurate centering that holds hole size to close tolerance. A built-on diamond wheel dresser is standard. Write the company for details, or Circle Inform-A-Gram No. P13.

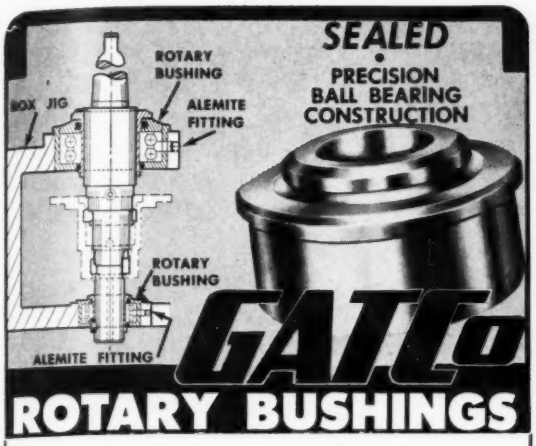
New Sheet Stacker



This new stacking unit is suited for use in conjunction with shearing, blanking, dry film coating and other operations to make neat stacks of sheets on pallets, skids, or dunnage. Sides adjust in or out for width variations in stock, and back guides adjust forward or backward to accommodate various sheet lengths. Sides swing out from center for access to remove completed stacks. Side gates raise or lower to handle an optional powered index conveyor that transfers completed stacks out to the side of the stacker. Write for details to Die & Automation, Inc., 5353 Dixie Hwy., Hamilton, Ohio, or Circle Inform-A-Gram No. P12.

Recessing Breakthrough

This Intramatic recessing tool has these features: wide face or multiple - form groove capability, deep grooving capability, no limitation on groove position regardless of remoteness from entry face, back spotfacing to a maximum diameter of two times hole diameter. It pilots directly in the part for use with any machine tool, without fixturing, or may be furnished to accommodate employment in conjunction with existing drill jigs, etc. One basic model will accommodate holes within the range of ¼″ to 2″. Write for details to Nobur Mfg. Co., 6860 Farmdale Ave., N. Hollywood, Calif., or Circle P14.



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For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

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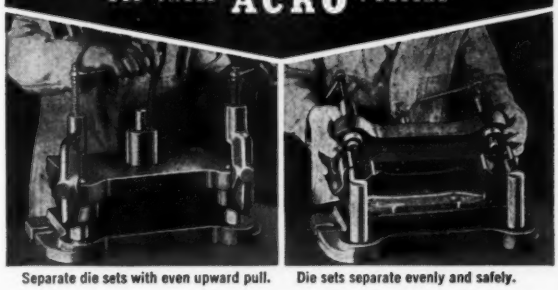
USE THESE ACRO PULLERS



Separate die sets with even upward pull. Die sets separate evenly and safely.

When you have die set pullers that remove the punch holder from the die shoe by a straight upward pull and the punch holder slides upward from the die shoe simultaneously and safely from both leader pins, you have Acro Die Set Pullers and you're saving time.

If you're not, this is how it's done with Acro Pullers: *Indexed* screw wrenches act as indicators, controlling the upward travel. This is an exclusive patented Acro feature and found only in ACRO DIE SET PULLERS. It may pay you to investigate. Write for further free information today.

OTHER ACRO TIME SAVERS FOR YOUR SHOP include Acroflex, drill rod racks, leader pin oilers and wing nuts. Write for complete descriptive folder. Ask for bulletin TP59.

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3387 E. Reservoir Ave., Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1352

LINDERME
2-SPINDLE ADJUSTABLE DRILLING HEAD

Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models. 1/2" to 12-5/" centers. The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with over-arm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drill or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads. Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks. Write for full information.

LINDERME ENGINEERING & SALES
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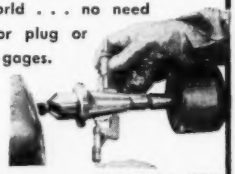
Measure Tapers without removing work from machine!
Accurate to ±.0002" • Saves 300% of time!
Taper Mike is the only tool of its kind in the world . . . no need for plug or ring gages.



Internal 1/2 to 1 1/4" tapers and up.

External 0 to 1 1/4" and up.

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IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

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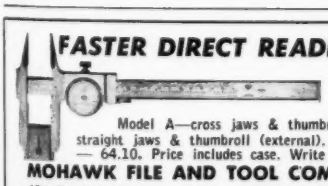

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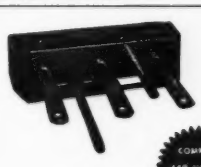

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Write for circular and prices

COOK'S LEAD HAMMER SERVICE
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CIRCLE INFORM-A-GRAM KEY NO. 1357

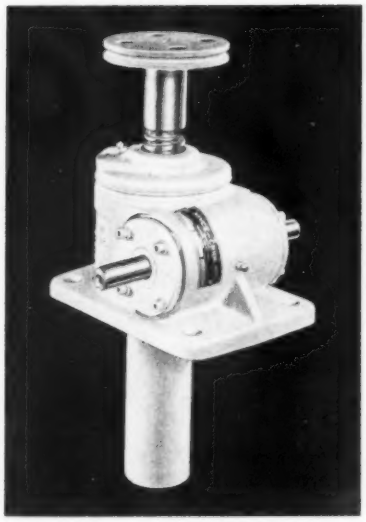
Product News

Cut-Off Machine

A 14″ air-operated automatic cut-off machine for ferrous or nonferrous tubing, extruded shapes and bars has been introduced by Cleveland Pneumatic Industries, Inc., 2415 No. Burdick St., Kalamazoo, Mich. It cuts most shapes

to 3″ in standard bar lengths, solid stock to 1¼″, and the feed stroke is variable from 3/16″ to 8″. The 14″ wheel travels at 3000 rpm. The unit operates on 10 to 100 psi air supply, and averages 2½ to 4 cu ft/min on continuous usage. Get specifications from the company, or Circle No. P15.

Jack Line Expanded



Two-ton and five-ton capacity worm gear screw jacks have been added to the line made by Joyce-Cridland Co., 2027 E. First St., Dayton 3, Ohio. Uses include vertical adjustment of production machinery and stabilizing of mobile devices. The two-ton model has a worm gear ratio of 6:1; the five-tonner is available in 6:1 and 24:1 models. Drive mechanism has been designed to withstand bi-directional vertical loads. Get more information from the Company, or Circle Inform-A-Gram No. P16.

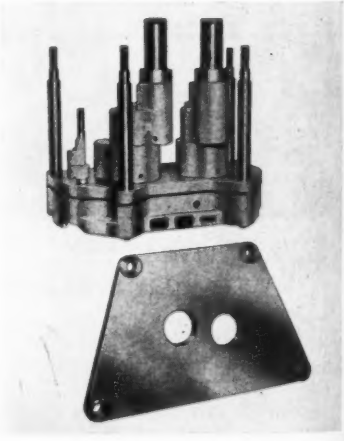
New Plug Gages

These new tenth plug gaging systems have a guaranteed "X" tolerance +0.00004, −0.00000, approximately one rms finish, and provide 289 different "go-no-go" combinations in each 25-gage set. Nominals are available in all fractional sizes from 3/64″ to 1″, as well as most decimal sizes. They're

well suited for measurement of hole spacing and dovetails, establishing size and inspecting bored holes, and inspection of concentricity. Get further data from Deltronic Corp., 929 Baker St., Costa Mesa, Calif., or Circle P18.

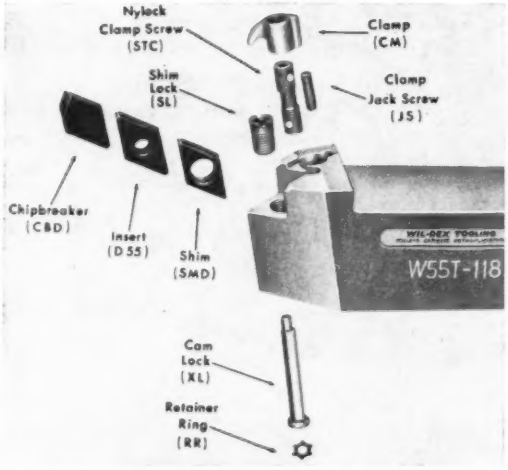
Adjustable Drillhead

Multiple spindle drilling of large holes in hard-to-machine material is said to be practical with this new double eccentric adjustable drillhead. Model pictured drills 2″ dia holes in solid steel forgings. As a size comparison, a spindle bracket assembly for ¼″ drills in steel is shown standing at left on the larger drillhead. Each spindle of the big job adjusts anywhere within a radius of 7.2″ about the drive, and a maximum center distance of 22.4″ is possible. Ask for further data from Thriftmaster Products Corp., 7048 N. Plum St., Lancaster, Pa., or circle No. P19.



Eliminate Insert 'Wobble'

A "cam lock" that pulls the carbide insert back into the pocket and locks it there is the new feature of this indexable tracer lathe toolholder. Insert movement during operation is said to be virtually impossible with the unit. Heavy cuts to close tolerances are therefore possible. Varying cutting pressures won't change insert position. This "Wil - Dex" holder uses diamond shaped inserts that quickly conduct heat away from the cutting edge, and are indexable four times. Request further information on 11 standard sizes from Willey's Carbide Tool Co., 1340 W. Vernor, Detroit 1, Mich., or Circle Inform-A-Gram P17.



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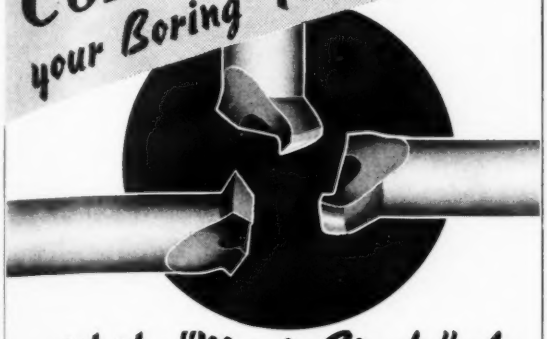

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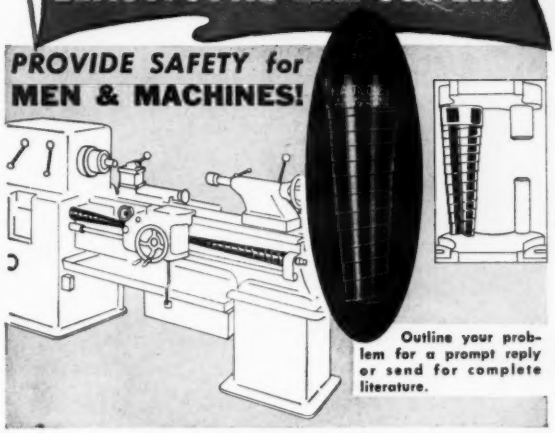

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Clip and attach to your letterhead. Sign and mail to:

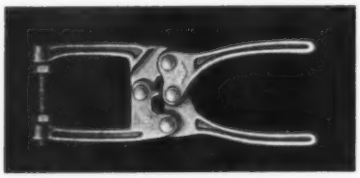
STOCKER & YALE, INC., 43 Green Street, Marblehead, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1373

Product News

Tiny Toggle Plier

The 8-oz Model 505 is the newest addition to the Wespo plier line made by Vlier Engineering Corp., 26935 W. Seven Mile Rd., Detroit 19, Mich. It's made with alloy steel forgings and stainless steel rivets.

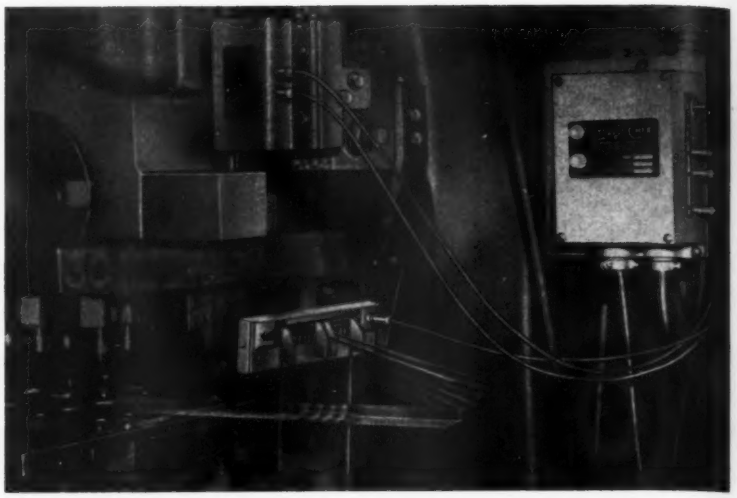


Over-all length is 6", throat depth 1⅞", jaw width 1¼", and spindle is ¼-28. Ask for more information on the model by writing the company, or Circle Inform-A-Gram No. P20.

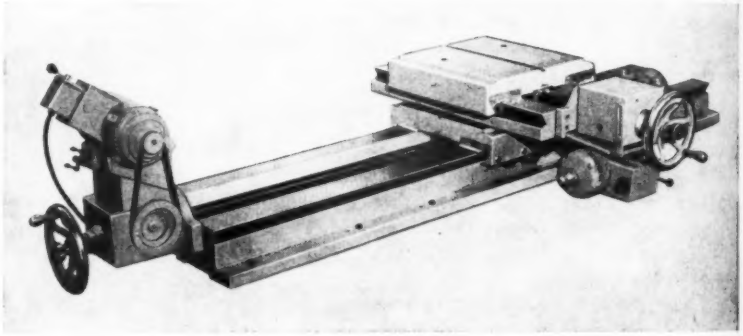
Feed Tables, Slides

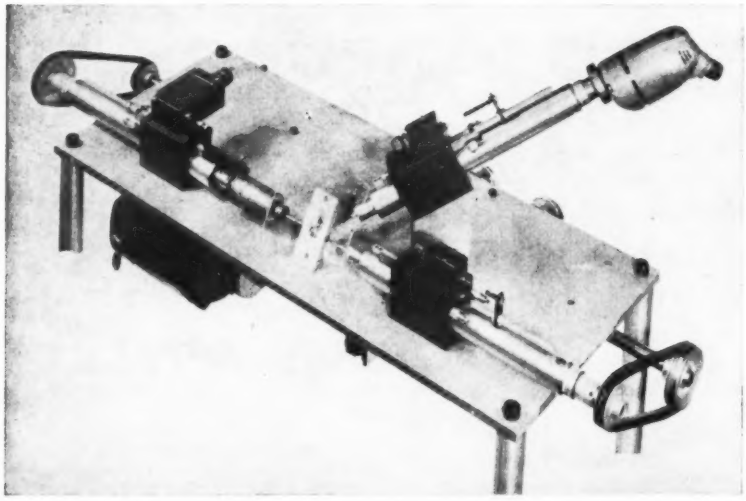
New feed tables and slides for special machines are offered by Master Mfg. Co., Inc., Hutchinson, Kan. The powered, erector-type units range from 9" to 2' wide, and give up to 15' longitudinal travel. Standard models offer electric, hydraulic, and pneumatic power, besides manual feed. They feature precision movement, scraped dovetail ways, and rigidity. Uses include positioning or feeding of workpieces or the machining unit. Ask for the company's descriptive catalog, or Circle No. P21.

Press Control Device



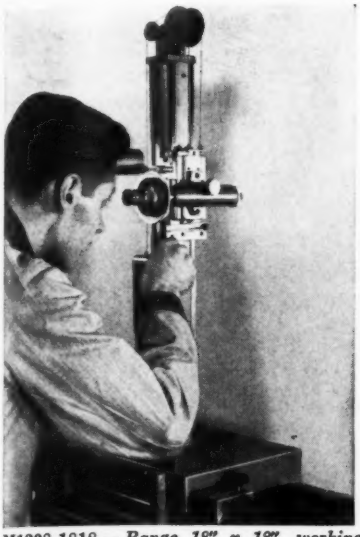
The all-electric "Cycle-Check" is designed especially for punch presses. It consists of three main components with visual indicators to keep the operator informed of the condition of the dog-type and air clutch presses it fits. Individual swinging contact fingers slip off without removing the switch frame from its mounting. Ejected parts cause the finger to swing out and engage the contact spring with a wiping action well suited for positive electrical contact. Request more details from Rehrig Safety Controls, 3730 E. 26th St., Los Angeles 23, Calif., or circle Inform-A-Gram No. P22.





Angle Drilling

A new multi-angle drill has a drill capacity of ¼" in steel, and the mounting flexibility to handle angle or off-line drilling jobs. It uses a two-way air cylinder which provides both feed and return of the spindle. Any length stroke may be set, up to the unit's 4" capacity. It's designed to permit quick attachment to a flexible shaft or an electric power source. Standard accessories include mounting brackets, adapters, pulley drives and offset universal joints. Get literature from Commander Mfg. Co., 4225 W. Kinzie St., Chicago, or circle Inform-A-Gram No. P23.



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

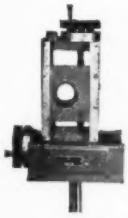
with new Gaertner Coordinate Cathetometers

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.



M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

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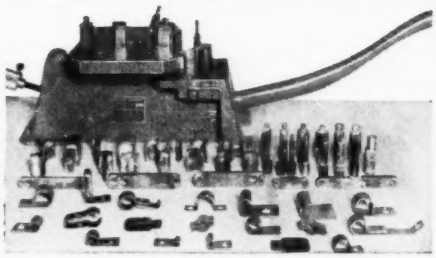

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CUTS, BENDS, PUNCHES

Available in hand, air or hydraulic models. The MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛" x 1½" as illustrated. Punching dies available. Other models up to ½" x 8" hydraulic operated. Ideal for steel rule die forming.

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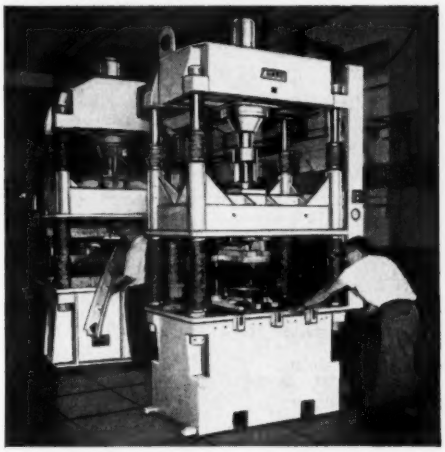
Two DAKE DIE TRYOUT PRESSES in Custom Die Shop?



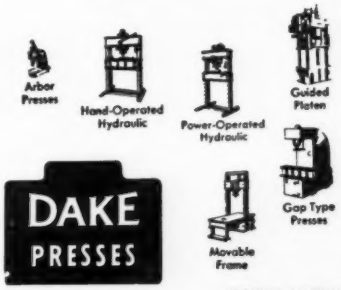
Greenville Tool & Die Company, Greenville, Michigan, purchased a 150-ton Dake Hydraulic Die Tryout Press to relieve the workload on their mechanical facilities. After delivery, management discovered that the backlog of work for the Dake press was far greater than it was for the mechanical presses. Its smooth, accurate operation enabled it to easily handle press work that would otherwise be difficult or impossible. A second Dake Hydraulic Die Tryout Press was installed because *no other press could do as much work so well.*

The Dake Die Tryout Presses can be stopped and reversed at any point in the stroke—diemakers can see just when and why blanks are "dragging" or "tearing," and their large daylight area allows the die to be "barbered" without removing it from the press.

At the Greenville Tool & Die Company, Dake presses are also used to align punches, "shear-in" irregularly shaped surfaces, develop blank sizes and shapes, find the right redraw depths, and even straighten heat-treated die parts.

Dake Die Tryout Presses are available in 9 standard models from 25-ton to 300-ton capacity, and in custom engineered models to 600-ton capacity to meet special requirements. Send for Bulletin No. 330 for specifications.

DAKE CORPORATION, 634 Robbins Road, Grand Haven, Mich.



SEND TODAY FOR BULLETIN 330

DAKE CORPORATION
634 Robbins Road, Grand Haven, Mich.

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Name_____

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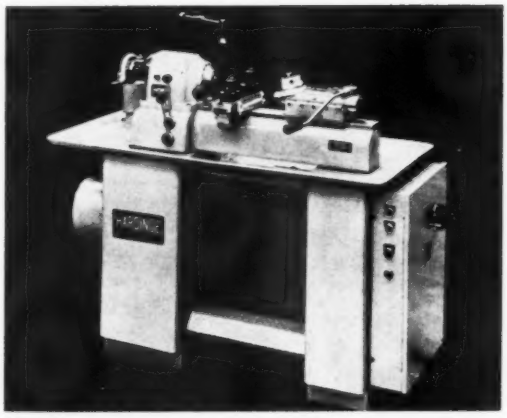
CIRCLE INFORM-A-GRAM KEY NO. 1393

Product News

Secondary Operations



Model DSM59-R is described as a "super-precision second operation machine" by builder Hardinge Bros., 1420 College Ave., Elmira, N.Y. It provides 1-1/16" round collet capacity through the spindle, step chuck capacity to 6", swing over the bed 9" in diameter, and spindle speeds to 4000 rpm. Headstock spindle is mounted on super-precision pre-loaded ball bearings. The machine includes a self-contained driving unit mounted in the welded steel pedestal base. Ask the firm for more data, or Circle Inform-A-Gram No. P25.

Setups Facilitated

This "Triangulator" consists of two 360° protractors set at 90° to each other to solve the time-consuming compound angle setup problem. By use of release levers to disengage the worm gears, any compound angle on a spherical arc can be set, adjusted and locked within one minute of arc. The unit is suited for inspection, layout,

grinding and drilling applications, and has found early use in proving gyroscopes and guidance units for missiles and aircraft. Request more information on it from Scientific Engineering Co., 11126 Weddington St., N. Hollywood, Calif., or Circle Inform-A-Gram No. P24.

Grinder Control Unit

A transistorized dimensional control unit for grinders is available from Federal Products Corp., Providence, R.I. It can be used with various gage tooling to provide automatic control of plunge cut and internal grinding. Four basic models cover single or double-limit control of ID or OD grinders. Loss of either air pressure or electrical power automatically retracts the grinding wheel. Each unit has built-in testing facilities to permit rapid tracing and isolation of trouble independent of machine operation. Request more data from the company, or circle Inform-A-Gram No. P26.

Finishing Equipment

A new line of brushing tools for many finishing operations includes models with wheel diameters of 4" to 12". Their controlled cutting action is said to minimize peening and rolling of metal edges. Edge blends can be held to close tolerances, allowing production finishing of pump gears and similar

products requiring 0.005" edge blend. Blended, straight wire cutting points are encapsulated in a plastic bond to control finishing action. Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio, will furnish more information, or Circle Inform-A-Gram No. P27.

Midget Actuator

Reciprocating rotary motion is the forte of this midget Rotac torque actuator for light applications. Body is just 2" square, and 2" long. The little model operates by hydraulic or pneumatic pressure. A single vane model produces rotation in a maximum arc of 270°, while movement of the double-vane model is restricted to 90°, though power is more than doubled. Request Bulletin 266013 from Ex-Cell-O Corp., 945 E. Sater St., Greenville, Ohio, or Circle Inform-A-Gram No. P28.

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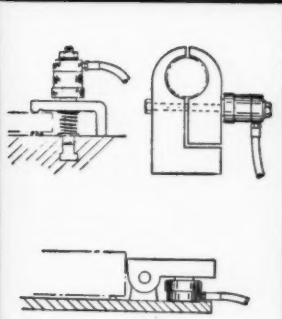
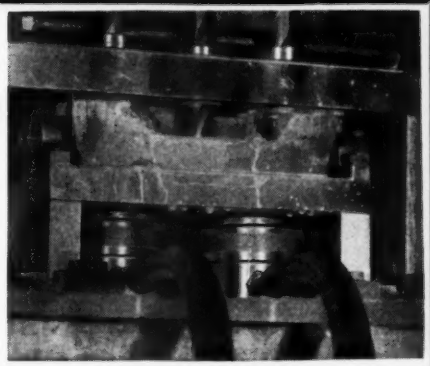
CIRCLE INFORM-A-GRAM KEY NO. 1411





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CIRCLE INFORM-A-GRAM KEY NO. 1412

KNOW *Your Sheet Metal Capabilities—*

Check it with this

Ductility Tester

This highly sensitive sheet metal tester takes specimens up to 3/16" thick, applies up to 30,000 lbs. pressure. The completely enclosed hydraulic system is directly driven by an electric motor. Both one and two gauge models are made.

By turning one control, this machine grips the specimen, tests it, and releases it. Gripping pressure increases in proportion to test pressure. The test is made in full view and the results are read from the gauges' maximum indicator needles.

Write today for more information on ductility testing

DETROIT TESTING MACHINE COMPANY
9386 Grinnell Avenue, Detroit 13, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1413

WHEN IT COMES TO REPEAT HOLDING OPERATIONS THEY ALL AGREE . . .

Machinist, tool engineer, purchasing agent, and production manager all agree *that Graham is America's number one machine vise.*

Why? It's as simple as this. *Machinists* know that a vise doesn't have to weigh a "ton" to be tough—do a rugged job. So they appreciate Graham's light weight, compact construction, and accuracy. The *tool engineer* appreciates accuracy too, but he's also interested in the fact that Graham's versatile attachments eliminate the need for many custom jigs and fixtures. Production managers also want to cut costs and they know that Graham equipment is so easy to change from one job to another, *set-up time is cut by 30%.*

As for purchasing—these men have found that Graham is competitively priced and made to provide a lifetime of uninterrupted service.

Graham is the only vise with a complete set of interchangeable jig attachments (that eliminate the need for many custom jigs and fixtures). And there's a model for every job, a size for every requirement. There are also swivel-base models (360° rotation) and self-centering (for quick positioning regardless of size variations).

There are the facts, the reasons why all men concerned with the selection of machine tools specify Graham Multi-Purpose Machine Vises—and have for over fifty years.

For complete specifications and prices . . . .

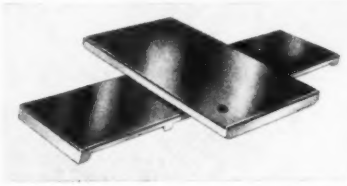
THE GRAHAM MFG. CO., INC.
East Greenwich, Rhode Island

CIRCLE INFORM-A-GRAM KEY NO. 1421

Product News

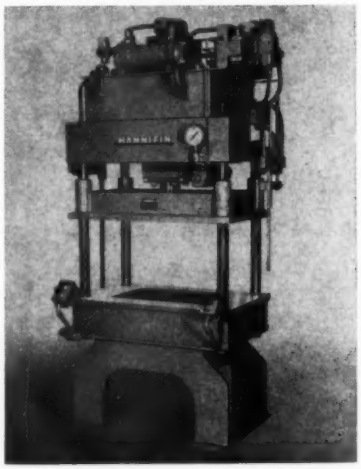
Liners and Wear Plates

The steel liners and wear plates made by Ohio Knife Co. are made by bonding ball bearing tool steel to a mild steel backing material that's easily machinable. These plates for machinery have a uniform depth of hardness (minimum R_C 64) over their entire lengths.



They're said to withstand any pressure a solid steel plate will withstand, and not to score under severe use. Get more information on these wear plates from the company's Dept. LL-512, Cincinnati 23, Ohio, or circle Inform-A-Gram No. P29.

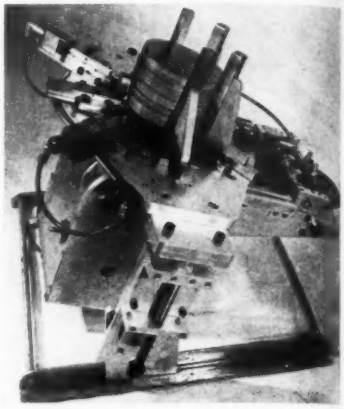
New Trimming Press



The Series T4C 30-ton four column hydraulic trimming press for large dies features high speed advance to 1300 ipm, though ram speed may be reduced to 240 ipm at casting contact. Trimming action is by a "squeeze" rather than a blow. It has a 29 x 42" base, a 20" full stroke and a 30" gap. Other models in the T4C series offer 10 to 150 ton working capacities. Write for more information to Dept. 164, Hannifin Co., Des Plaines, Ill., or circle Inform-A-Gram No. P30.

Press Feeder Improved

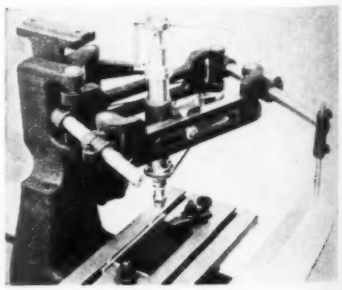
This press feeder is designed by Clark Industries, Delaware, Ohio, to separate flat blanks that stick together due to heavy die lubricants or highly polished surfaces. The separation is accomplished by the combination of lateral and horizontal movement of the bottom



blank of the feeder's top-load magazine. An adjustable speed conveyor feeds blanks into the die nest without bounce-back or misalignment, and an automatic safety stops the press in case of double feed. Get more information from the company, or Circle P31.

Engraving Machine Adaptation

A new cutter spindle that accommodates Jacobs Rubber-Flex collets has been developed for the UE-3 and 3D-5 Panto engraving machines made by H. P. Preis Engraving Machine Co., 284 Industrial Branch, U.S. Hwy. 22, Hillside, N.J. With the adaptation it's no longer necessary to use a separate collet for each different diameter, and cutter capacity has been increased from 3/16" to ¼" maximum. The collets will hold any cutter or drill from 0.094 to 0.250 dia. Get additional data from Preis, or circle P32.



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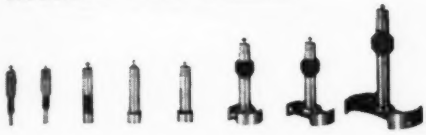
and here's why...

For holes ⅛" to 10" diameter



Comtorplug's unique expansion principle gives automatic 2-point gaging shown as a fixed reading to a fraction of the large clear .0001" graduations. With its true 2-point gaging, you can see the diameter at any point of the bore, detecting front or back taper, ovality, barrel shape, bell mouth, etc. If you have a fast-moving volume-precision program, learn why others have adopted this "tells-all" gage by the thousands. It's not expensive. Write for details.

Comtor Company, 82 Farwell Street, Waltham 54, Mass.

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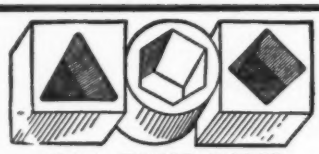

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CAM CALCULATING SERVICE

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Chas. Eisler, Jr., President
732 So. 13th St
Newark 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1445

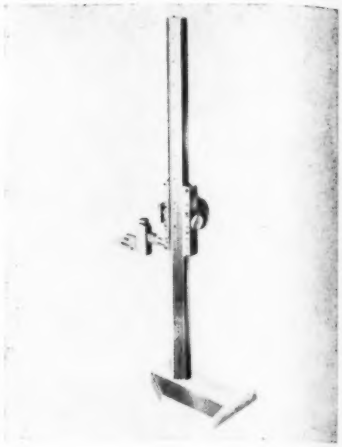
Product News

Bushing Lock Liners

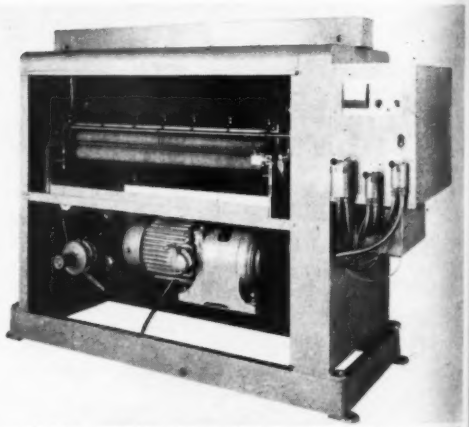
The drill bushing lock liners made by American Drill Bushing Co., 5107 Pacific Blvd., Los Angeles 58, Calif., are said to eliminate the lock screw formerly needed to secure renewable slip drill bushings in place. They come with

ground or unground outside diameters, or with Delt-A-Liner OD's for use in plastic tooling. A finger-tip twist of the bushing locks it into the liner, or removes it for instant interchangeability. Drill rotation locks the bushing in the liner during drilling. Write the company for details, or Circle Inform-A-Gram No. P33.

Height Gages

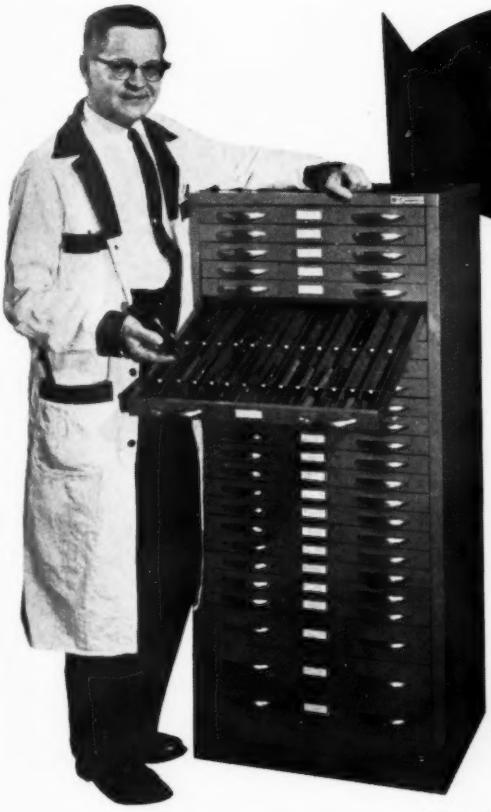


These hard chrome height gages have 50 widely-spaced graduations in inches and millimeters, and come with fitted case in 12", 18", 24", 36", and 48" lengths. Vernier scales are adjustable, and accuracy of a setting may be checked without gage blocks. Centrally-positioned lock screw's clamping action is said to eliminate slight inaccuracies. The gages' sliding jaw is machined from solid tool steel, and operates without a gib-piece. Straight scribers are tungsten carbide tipped. Request more data from Mueller Gages Co., 1052-1058 N. Allen Ave., Pasadena, Calif., or Circle Inform-A-Gram No. P34.



Sheet Surfacer

The combination of variable speed, feed, work pressure and oscillation is said to make it easy to do on any surfacing operation on practically any sheet material with this Tri-Matic sheet surfacer. It uses abrasive impregnated nylon mounted on an oscillating arbor which is adjustable from 0 to 400 times/min. It's offered with practically any length workhead from 48" up, with multiple heads on the same work conveyor, and can be furnished for wet or dry operations. Write for details to Sales Service Mfg. Co., 2363 University Ave., St. Paul 14, Minn., or circle Inform-A-Gram No. P35.



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CIRCLE INFORM-A-GRAM KEY NO. 1451

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finishes under 10 microinches!

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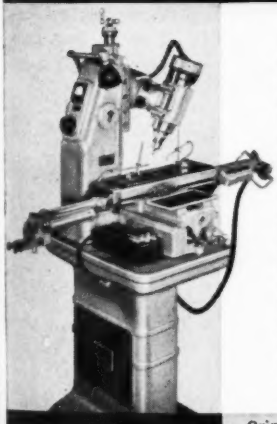

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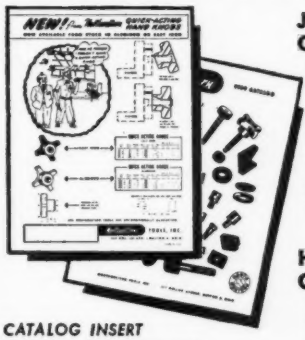
ALUMINUM CAST IRON

QUICK-ACTING HAND KNOBS



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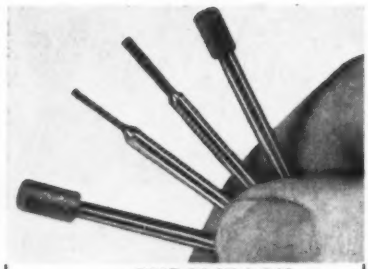
CIRCLE INFORM-A-GRAM KEY NO. 1453



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25 Sizes in 0.010 increments, from as small as 0.020 to 0.500" offer a low cost solution to precision jig and internal grinding of small holes. Diamond grains are permanently surface bonded to a tool steel shaft by an exclusive Chrome-Lok process for maximum strength, precision and tool life. Two grit sizes—80/100 for faster metal removal; 200/240 for finishing —all with cylindrical heads.
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Please send catalog #53 and full details of **ENCO 12-station tool post turrets.**

Name_____

Firm_____

Address_____

CIRCLE INFORM-A-GRAM KEY NO. 1462

Product News

Tough Marking Simplified

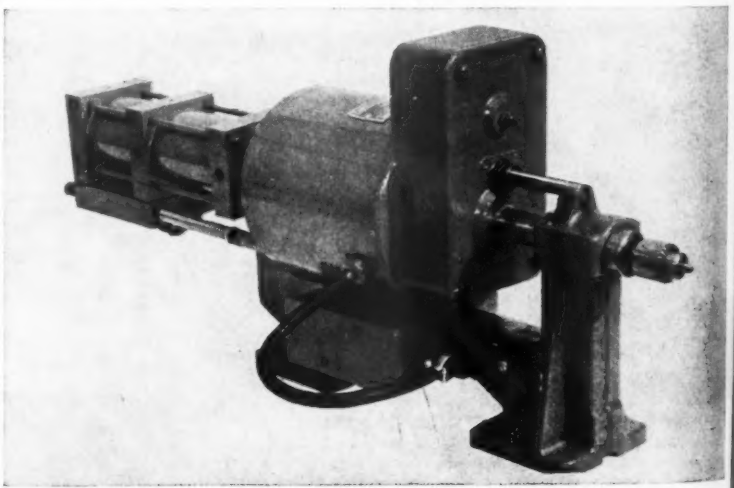
A new marking fixture for stamping in confined areas on a range of sizes of round parts has been developed by M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, Pa. It uses extra long, straight body type to mark in a limited area, e.g., within 3/64" of a flange on a series of parts ranging from 7/16" to 1¾" dia and up. An arbor holds and rotates the part to be marked, and the fixture includes an adjustment screw to compensate for varying diameters and desired depth of impression. Write the company for details, or circle Inform-A-Gram No. P36.

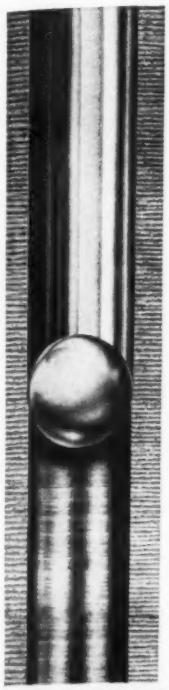
Double-Acting Cylinders

Rolled in construction on the rear head as well as the front head has been built into these air cylinders by Bimba Mfg. Co., 111 Main St., Monee, Ill. The 1-1/16" bore double acting cylinders come in stroke lengths through 3". They're said to offer long life because of the stainless steel body's smooth finish and the use of piston "U" cups. Write the company for details, or circle No. P37.

Small Hole Drilling

The Model 113-3½" small hole drilling unit has an electric motor spindle, and air feed with hydraulic control. Stroke length is 3½"; chuck capacity is ¼". Seven sets of timing belts and pulleys provide spindle speeds from 750 to 15,800 rpm. Request literature on the machine from Electro Mechano Co., 241 E. Erie St., Milwaukee, Wis., or circle Inform-A-Gram No. P38.





How To Size And Finish More Holes Per Dollar

In brief: *Ballize* them.

Ballizing brings holes to size in *seconds*, with high precision and fine finish — *faster* and at *far less cost* than any other method — simply by forcing a precision ball through the unfinished hole.

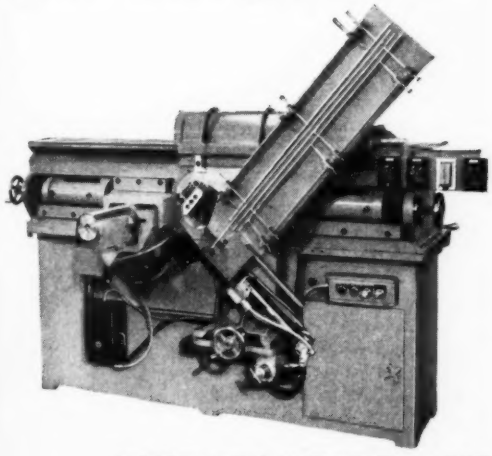
This process uses *any* machine having a ram or push rod — has no close adjustments or tool maintenance — uses unskilled labor — cuts scrap and inspection costs. It saves and saves.

FREE BALLIZING BULLETIN gives full details; shows typical setups; gives cost and production data. *Write for it!*

INDUSTRIAL TECTONICS, INC.
MANUFACTURERS OF PRECISION BALLS AND BEARINGS
BALL DIVISION: 3686 JACKSON RD.
ANN ARBOR 4, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1471

Tool this shell trimmer for $200 and trim up to 1100 drawn shells per hour

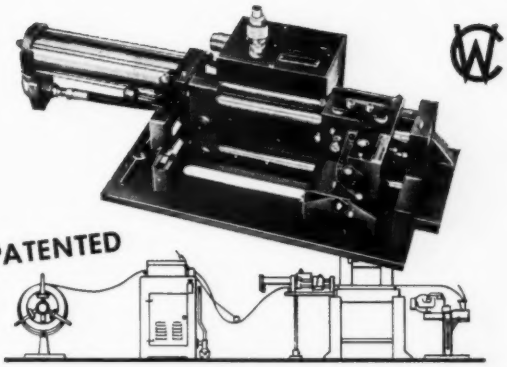


WRITE FOR BULLETIN F-25C

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1472



PATENTED

air operated slide feeds

The proven, low-cost way to get increased output and efficiency from your present stamping and shearing equipment. Ideal automatic operation even on short runs and frequent changeovers.

Simple, versatile, self-contained — operates from standard air lines — install directly on press bolster — simple air valve and cam timing — quick, accurate single-screw feed adjustment — open throat construction handles widest range of stock widths — nine sizes, with strokes to 24", for flat or irregular stock to 3/16" thick and 30" wide in lighter gauges.

FOR A FULLY AUTOMATIC STAMPING LINE also ask about Cooper Weymouth combination cradles and straighteners, stock reels, stock and wire straighteners, scrap choppers and small parts straighteners.

COOPER WEYMOUTH, INC.
603 Honeyspot Road, Stratford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1473

Save Time, Money, Labor

find cracked parts quickly, easily, with

MAGNAFLUX Spotcheck®
DYE PENETRANT INSPECTION

***NOW*— Fire-Safe MATERIALS at same low prices**

HERE'S WHY
Cracks, pores and defects open to the surface can cause rejects or failure in service. In parts or machinery this can mean costly repairs, prolonged downtime, extensive damage, even loss of life! Cracks can be eliminated thru inspection at any stage in manufacture, — or during maintenance overhaul.

HERE'S HOW
Inspect with easy-to-use Spotcheck. Dye penetrant inspection becomes as simple as pushing a button. All materials available in spray can and Fire-Safe— cleaner-dye remover, penetrant, developer. Defects are clearly defined as bright red marks against the white of the developer. Works on any solid material! Bulk materials also available, up to 55 gallon drums.

COMPLETE SK-3 KIT only $36.00
U. S. A. only
F. O. B. our plant
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Everything you need in handy, rugged steel carrying case. 2 spray cans Penetrant, 2 spray cans Developer, 4 spray cans Cleaner-Dye Remover, instruction book, cleaning cloth, wire brush. ORDER FROM YOUR DISTRIBUTOR, OR DIRECT!

MAGNAFLUX CORP., 7339 W. Ainslie Ave., Chicago 31, Ill.
☐ Please send me _____ SK-3 Kits at $36.00 each, F.O.B. Magnaflux plant Chicago.
☐ Send FREE bulletin only. Includes low Spotcheck material prices in bulk.

Name _____ Title _____
Company _____
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CIRCLE INFORM-A-GRAM KEY NO. 1474

* Acme industrial figures your time is money. So . . . Acme saves it for you. The FREE Lock Screw Locating Jig instantly gives location for lock screw drilling and tapping. Handy? You bet. Free? Honest. A daily time and work saver? Certainly. No. Acme bushings (all 30,000 sizes of them) aren't free, too. But just as important, they're close as your nearby Acme distributor. Fastest delivery standard . . . finest quality (a tradition) expected . . . dependable precision remarkably perfect.

ACME INDUSTRIAL COMPANY
204 North Laflin, Chicago 7, Ill.

SAVE... my time and work! Send me a FREE Lock Screw Locating Jig. No obligation, of course.

☐ Send your bushing catalogs, too.

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Firm_____
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CIRCLE INFORM-A-GRAM KEY NO. 1481

Product News

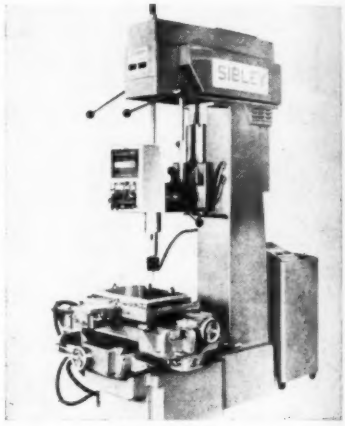
New Slicing Machine

The MTM-612 is designed for precision slicing of silicon, germanium, quartz, ceramics, ferrites and carbides. It has a 6" x 12" table, 12½" table traverse, and 6" cross-feed, and includes precision spindles and automatic lubrication, drive and coolant systems. A filter in the coolant system reclaims the swarf. A thin diamond cutting wheel is driven without vibration by the precision spindle and flat belt drive. More information on

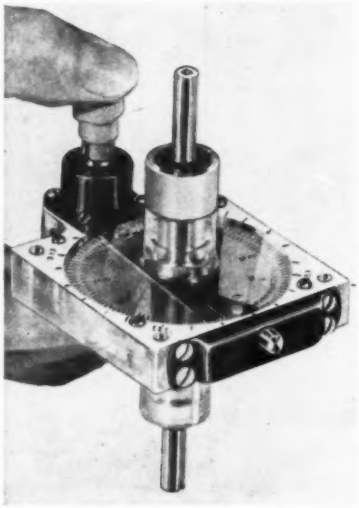
the unit is available from DoAll Co., Des Plaines, Ill., or circle Inform-A-Gram No. P39.

New Drilling Machine

The 40" swing HT-40 drilling machine features automatic work positioning and program control. It has a 2 axis point-to-point positioning table reputedly accurate to ±0.001. Spindle runout is less than 0.0005. Lead screw controls table through 14" x 18" of travel dictated by two steel tapes indented during the initial setup. The head-mounted panel contains all table and machine controls, and a system of lights that eliminate operator error by indicating tool change, table position, etc. Get more information from Sibley Machine & Foundry Corp., 206 E.



Tutt St., South Bend, Ind., or circle Inform-A-Gram No. P40.



Sensitive Torquemeter

This #782 gram-torquemeter reads values from ¼ to 100 Gm-Cm's at speeds from 0 to 5000 rpm bi-directionally. Its clear acrylic housing permits reading from either side. Both dial and pointer rotate, resulting in only 10 gram (plus coupling) weight to connected load. Movement is a balanced dual spring, direct reading element, with no gears, through 325° scale. Accuracy of the unit is 3%. Get further data from Power Instruments, Inc., 7352 N. Lawndale Ave., Skokie, Ill., or Circle Inform-A-Gram No. P41.

For { 3-STATION PRODUCTION MACHINING / 1½" BAR AND COLLET WORK / CHUCKING / SINGLE POINT THREADING

Costs { $7,167.00 FOB Factory Complete with all standard equipment

This is an all new 1½" bar capacity ram type turret lathe with power feeds to all 8 working stations . . . that in addition to bar and collet work also has the versatility to do chucking, and when needed, single point threading. Powered by a 5 h.p., two-speed, geared motor, the new Sheldon 3 R turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide, and 180 different feeds to the ram turret.
The turret itself is ruggedly built and accurately machined to provide close tolerance indexing. And for complete ease of operation, it is put under power by simply pressing a push button on the control panel.

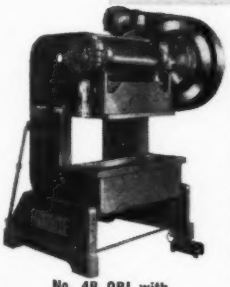
This new 3 R Sheldon is completely equipped with two-speed motor and electrical controls, coolant system and splash guards, LO spindle nose, large satin chrome dials and hardened bed ways. It also provides an additional cost saving feature—each turret face is drilled and tapped for your standard flange type tooling as well as being bored for your standard 1½" shank type tooling.
For versatile, accurate machining in either long or short runs, the new Sheldon 3 R provides the answer to low investment cost with high profit operation.

New SHELDON
3R-TURRET LATHE

Write for bulletin with complete specifications and tooling data

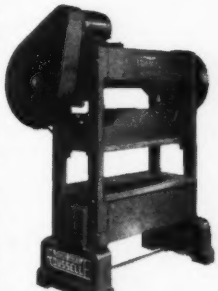
SHELDON MACHINE CO., INC.
4235 N. KNOX AVE. • CHICAGO 41, ILL.
Builders of 10", 11", 13", 15" Sheldon lathes, Sheldon Milling Machines, Sheldon Shapers and Sebastian Geared Head Lathes
CIRCLE INFORM-A-GRAM KEY NO. 1491

High-Output with ROUSSELLE
DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



Choice of over 30 models and types in 5 to 60-ton sizes

STRAIGHT SIDE – Die space up to 24 in.; bed space up to 6 ft. between uprights.

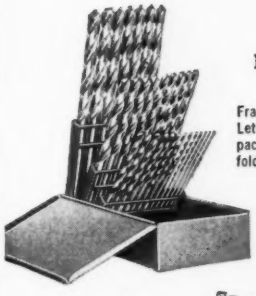
SERVICE MACHINE COMPANY
Mfrs. of Rousselle Presses
2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS
Rousselle Presses are sold exclusively through Leading Machinery Dealers.
CIRCLE INFORM-A-GRAM KEY NO. 1492

Highly polished flutes produce smoother, more accurate holes!

It pays to specify

ACE
DRILLS
REAMERS
BLANKS

Premium Quality High Speed Steel, Carbide Tipped and Solid Carbide.



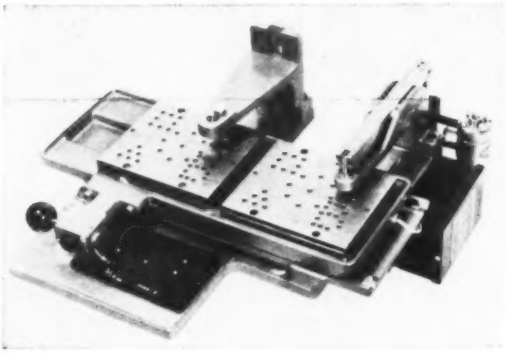
DRILL SETS
Fractional, Wire and Letter size drill sets packed in convenient folding index cases.

BLANK SETS
Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits.

Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS
CIRCLE INFORM-A-GRAM KEY NO. 1493

New Positioning Table

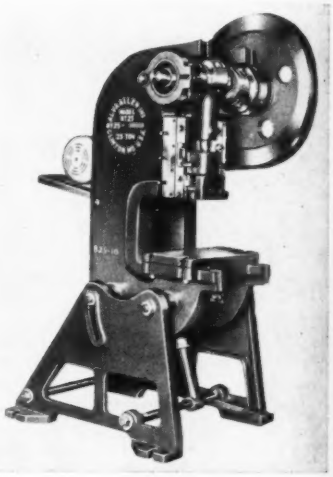


This positioning table is designed for drill press work in drilling, tapping, reaming, etc., and is especially well-suited for use with three models of Burgmaster 6-spindle turret drilling machines. The table working area is 4" x 5", and positioning accuracy is said to be ±0.0005. Its use eliminates the need for jigs and fixtures. Ball bearing mounting permits rapid positioning with minimum effort. Where the degree of accuracy is such that bushings are required, an optional outboard support bracket with its own bushing liner can be used, eliminating the need for a fixture. Get additional data from Burgmaster Corp., 15001 S. Figueroa St., Gardena, Calif., or circle Inform-A-Gram No. P42.

Product News

25-Ton Punch Press

The Model BT-25 is a 25-ton press made by Alva Allen Industries, 1001 - 15 N. 3rd St., Clinton, Mo. It has a die space of 7⅜" shut height, an 8" throat, and does blanking, forming, shearing, riveting, drawing, punching and crimping. It has a knife type clutch that can be set for continuous or single stroke action. Standard stroke is 2½", with strokes of ¼" to 4" available in ¼" graduations. Die bed is 12" x 21", with opening in the bed of 5" x 8". A mechanical tilting mechanism allows press to incline to 30°. Get more information from the company, or Circle Inform-A-Gram No. P43.



DI-ACRO ROD PARTER
cuts off 3,250 pieces/hr.
for Geometric Stamping Co.

Donald Boyd, methods engineer, shows parted stock and the formed part, handle for material handling equipment.

About 1½ million pieces of bar stock are parted off each year on a Di-Acro Power Rod Parter at the Geometric Stamping Co. Div. of Euclid Stamping Co. in Cleveland. Twenty-foot lengths of 5/16" cold drawn steel are cut to 7" pieces at a rate of 3,250 pieces per hour.

"Instead of investing in a single purpose punch press die," says Donald Boyd, methods engineer, "We picked the power parter for its versatility. On this job and a variety of other work the power parter has increased production two times—it's actually twice as fast. Incidentally, there has been little or no maintenance other than periodic lubrication and resharpening of die heads."

For your bar stock up to ⅝" in diameter, investigate the Di-Acro Rod Parter. Speedmatic gauge cuts as fast as operator can feed. Minimum distortion—pieces can be threaded without deburring. One standard die cuts eleven sizes of rod. Special heads for square, hex and other shapes.

DI-ACRO HAND OPERATED ROD PARTER

Same size-range and accurate parting as power parter. Ejectomatic gauge automatically clears die after each cut.

pronounced die-ack-ro

For free booklet, "Handy Guide to Rod Parters," consult yellow pages under Machinery—Machine Tools for your nearest Di-Acro distributor, or write us.

Find Us First In The Yellow Pages

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.

941 Eighth Avenue • Lake City, Minnesota

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PROTECT YOUR FUTURE
BUY
U. S. SAVINGS BONDS
TODAY!

NEW ROTOR *Airiter*

gives world's fastest, easiest marking

There's nothing like the new Rotor *Airiter!* It marks anything ... metal, plastic, glass, ceramic ... parts or tools ... as easy and fast as writing with a pen. No messy chemicals; no risky heat. Short-stroke carbide stylus makes up to 12,000 blows per minute. Speed and depth of mark easily controlled by throttle *on tool.* Will not stall while writing. Peening action ... does not remove metal. Weighs only 5¼ ounces. Try it in your shop and see how it writes circles around other methods! Write for Bulletin AR-2.

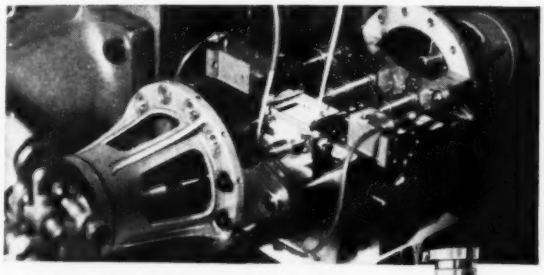
The Rotor Tool Company, 26325 Lakeland Boulevard, Cleveland 32, Ohio. Subsidiary of The Cooper-Bessemer Corp.

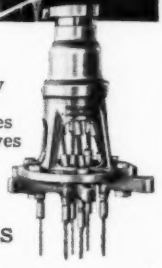
ROTOR TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1511

PAID FOR THEMSELVES

on the first job





MULTI-DRILLS are self-liquidating adjustable multiple spindle drill press attachments for production drilling. They multiply the speed, efficiency and production of men and machines many times over. They can quickly pay for themselves —often in the first week of operation. MULTI-DRILLS are available in many models designed to drill from 2 to 15 holes (and more) at one stroke of a drill press. Thousands of MULTI-DRILLS in use today are proving that you can save time and money by multiple drilling with a Commander Adjustable MULTI-DRILL. Ask your nearby Commander Distributor to show you how a MULTI-DRILL can reduce your hole costs.

Write for the Production Tool Catalog today.

110

Commander MFG. CO.

4228 WEST KINZIE • CHICAGO 24, ILLINOIS

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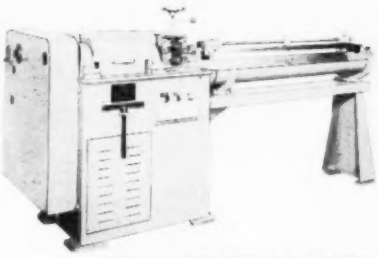
$HUSTER DOLLAR $AVER

STRAIGHTEN AND CUT A TON OF SMALL DIAMETER WIRE A DAY . . . EARN THE PRICE OF THIS MACHINE IN ONLY 16 WEEKS.

1V18 Shuster Production Booster

Capacity .062" To .125"



Compare $2595.00

HIGHEST PRODUCTION

LOWEST PRICE

WITH INFINITE VARIABLE SPEED

PRODUCTION 25 TO 150 F.P.M.

12000 CUTS PER HOUR TO 8"

• New electro-mechanical positive release target eliminates jamming • High speed straightening arbor boosts production • Timken bearing equipped feed-roll housing • Larger catch pan • Ideal working height.

METTLER MACHINE TOOL INC.

Boulevard Industrial Park, New Haven, Connecticut

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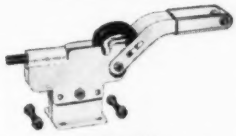
NOW! KNU-VISE GIVES YOU PUSH-PULL CLAMP CONTROL

P&P-1200
Hand Push-and-Pull Clamp



P&PSB-1200
Hand Push-and-Pull Swivel-Base Clamp

AOP&P-1200
Push-and-Pull Air-Operated Clamp

DON'T FORGET THE S.A.E. SHOW JANUARY 9-13 DETROIT, MICH.	VISIT THE LAPEER EXHIBIT BOOTH #1422 COBO HALL

Push the handle! Pull the handle! It makes no difference—the new Knu-Vise clamps by Lapeer give you uniform clamping of parts. That's real performance! Look at these features—

90° handle motion produces lock of plunger for push or pull without resetting of handle. Handle is reversible. Plunger guided by two widely separated, hardened steel bushings for accuracy in motion and minimum wear. Built-in deflection provides uniformly tight clamping of parts with normal variation in thickness. Swivel base model provides 90° total change in direction of plunger motion. The air (or oil) operated model, AOP&P-1200, produces approximately 4½ times the clamping force with 85 p.s.i. than the cylinder would alone. Failure of air (or oil) pressure does not permit reverse motion of plunger, thus not affecting clamping force.

All parts easily replaceable.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**

3064 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION
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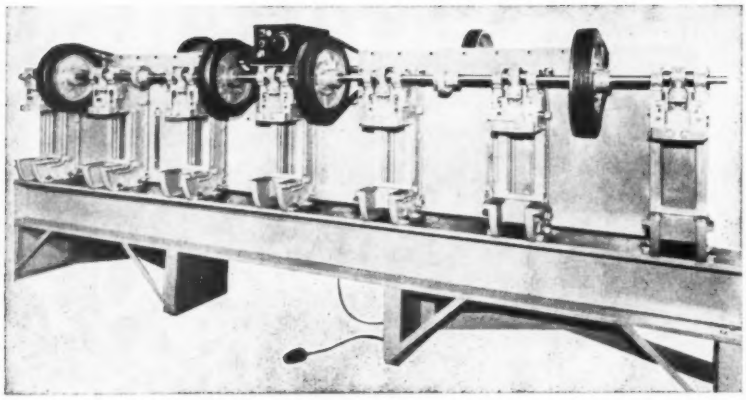
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1514

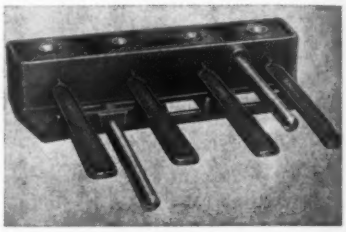


Novel Press Introduced

This Mark VII-8E press for fabrication of long material uses seven 8-ton punch presses to evenly distribute 56 tons over a 16′ length. Features include the absence of stored kinetic energy in the flywheel, and the absence of a clutch mechanism. Due to these factors, operator must fully depress two palm buttons, which are widely spaced out of the danger area, assuring his safety. If he releases either hand during the cycle, all power is instantly shut off, stopping the multiple unit. Further data is available from Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif., or Circle P44.

Hammer Molds

A new design bench-type production hammer mold which makes four 1-and-2-lb lead hammers in one quick operation is offered by L. H. Cook, Inc., East Providence, R.I. Hot lead can be poured directly into the mold, and



flows around the drop-forged handles and throughout the mold, assuring a good bond of head to handle. The firm also makes these molds for 3, 4, 5 or 6-lb hammers. Ask them for further details, or circle Inform-A-Gram No. P45.

Metal Forming Lubricant

A metal forming lubricant for use at temperatures between 1100 and 2200°F is said to prevent galling, scoring and metal pickup when forming most types of common steels, steel and copper alloys and the exotic metals. It's called Phosphatherm RN, and is a gradually softening mixture of phosphates and other salts. On sufficiently hot surfaces it forms an adhering, spreading melt that gives good lubricity to both forming tools and materials being formed. Ask for Bulletin 130 on it from Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn., or circle P46.

ON YOUR PRODUCTION LINE

Get pressure where you need it with a

HANNIFIN

FORCING PRESS

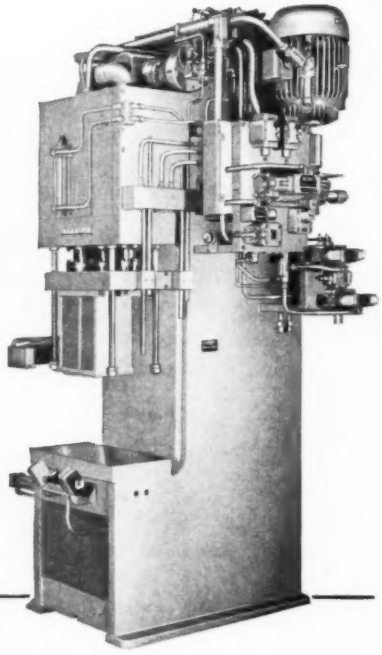
150 TONS to 1 TON

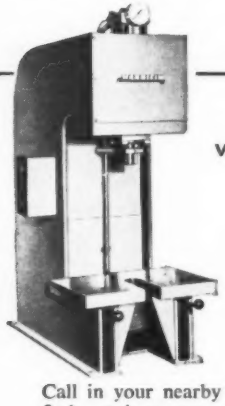
•

GAP OR COLUMN TYPES

•

HIGH SPEEDS · LOW PRICES





WITH THESE FEATURES:

1. All-steel welded frames—normalized.
2. Steel-head, heavy-duty cylinders.
3. Induction case-hardened rams.
4. Wide choice of ram speeds.
5. Built-in power units.
6. Wide choice of controls.
7. Special loading and unloading mechanisms where needed.

Call in your nearby Hannifin man—he's a trained production analyst—find out how you can do more at lower costs with Hannifin presses. Or, write for our new Bulletin 130-G. It tells the whole story.

PH 3168

PARKER HANNIFIN CORPORATION

HANNIFIN COMPANY

A DIVISION

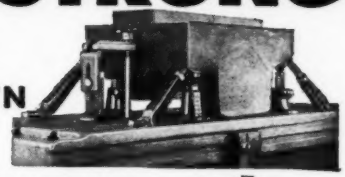
563 South Wolf Road • Des Plaines, Illinois

PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

CIRCLE INFORM-A-GRAM KEY NO. 152

ARMSTRONG

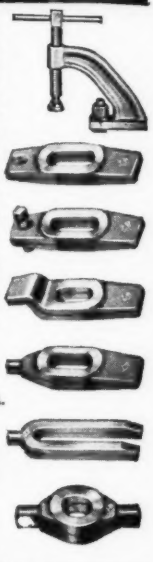
SET-UP *and* HOLD-DOWN TOOLS



ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for circular

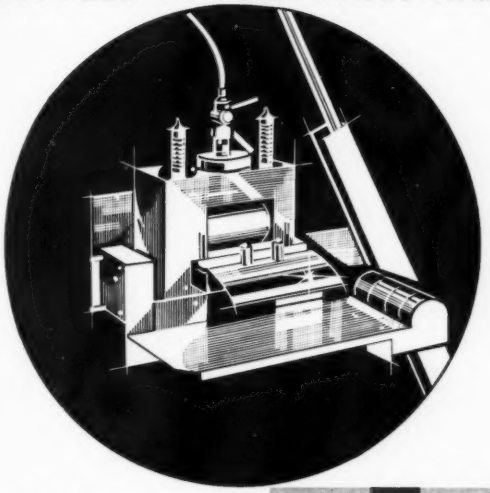


ARMSTRONG BROS. TOOL CO.

5220 W. Armstrong Ave., Chicago 46, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1531

MAKE MONEY . . . MATCH HAVIR'S AUTO-FEED TO YOUR PRESS-RITE!



HAVIR'S new Automatic Roll Feed is engineered especially for your Press-Rite 5 to 85 ton press—old or new! Not an accessory for any old press . . . but a high speed money-maker for Press-Rite owners.

Designed for longer feed lengths, with hard, precision ground rollers that are ball bearing mounted and driven by an over-running clutch. It's precision made by HAVIR for far better performance than any non-matching feed could give you.

Write for details today.

HAVIR MANUFACTURING CO.

436 Cleveland Ave. • St. Paul, Minnesota

HAVIR

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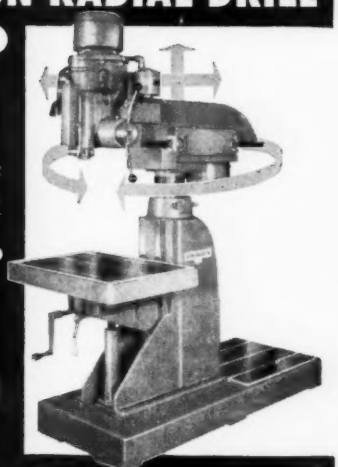
MANY HOLES FROM 1 SET-UP With A JOHANSSON RADIAL DRILL

Move the drill, not the work. Slides, elevates and rotates for quick and easy hole location.

8-speed gear drive. Proper speeds instantly—change while machine is running.

Large or small work pieces handled with ease—drill head swings 360° allowing work to be placed on front table or rear platform.



Drilling capacity . . . . . 1¾"
Spindle taper . . . . . Morse No. 4
Spindle speeds (8) . . Various Ranges
Spindle to col. (max.) . . . . . 36"
Spindle to work surf. (max.) . . . . 53"

Write for new catalog today.

I. O. JOHANSSON CO. 7248 St. Louis Avenue Skokie, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1533

FOR YOUR TURRET LATHES

NEW "LADCO" PATENTED INDICATOR

STOP GAGE

Holds Tolerances to .0005

Accurately Positions Universal Carriage. Easily Installed.

Screws Into Stop Rod

"LADCO" GAGE Offers BIG Advantages, Saves Time and Trouble in Set-Ups, Cuts Rejects!

This ingenious new "Ladco" Stop Gage accurately locates the universal carriage of turret lathes. Makes it possible to hold very close face-to-face or face-to-neck dimensions, or any dimension that requires an accurate longitudinal positioning of tooling mounted on the cross slide.

Gage has spring of about 300 lbs. pressure which disengages the longitudinal feed of the carriage without actuating the dial indicator. Available with Regular, or Waterproof Indicator—and also with .0001 Indicator. Ideal where accuracy is required. Write today!

THE LAD GAGE CO.

BOX "A" • GEAUGA LAKE, OHIO

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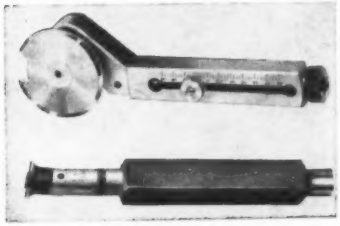
Patented MP TOOL

CUTS THREADS 40% FASTER!

Graduated scale for angular setting



PERFECT PROFILES: ENDS TORN THREADS

Cut costs sharply with MP tools for internal or external use. Thread is engaged depthwise by circular cutting disc (high speed or carbide) which has negative profile and adjustable angle. Machines both thread flanks simultaneously. Shavings released separately, can't disturb thread formation. MP pays for itself in savings. Swiss made with Swiss precision. Stock carried in U.S.

ACME TOOL CORP.

P. O. Box 1165 Coral Gables 34, Fla.

CIRCLE INFORM-A-GRAM KEY NO. 1541

IMMEDIATE DELIVERY OF CONTOUR CUTTERS For Standard Hydraulic Fittings... *In Stock*

AND 10050 Port Cutters

Turret Lathe and Drill Press Series: Carbide Tipped, integral reamer

Economy Series: Carbide Tipped, integral end pilot

Versatile Series: Carbide Tipped, interchangeable end, pilot and reamer

High Speed Steel Series: Integral end pilot, Super H.S.S.

"MS" Port Cutters

External Flat Form Tools

MS 33514: Carbide Tipped integral end pilot

MS 16142 "SAE": Carbide Tipped interchangeable end pilot and reamer

MS 33656 E and G; MS 33657E and S Stocked in Carbide Tip and H.S.S.

MS 33514E; MS 33515E and S Stocked in Carbide Tip and H.S.S.

Wetmore stocks the fullest line of Port Contour Cutters and Flat Form Tools for Standard Hydraulic Fittings to assure fast delivery. Where required, modification of standard contours can usually be made within 48 hours.

For Special Cutting Tools, Wetmore offers the finest design and manufacturing facilities backed with extensive experience to combine operations and also to machine "problem parts."

Write for NEW Free Catalog.

Wetmore Tools

Wetmore Tool and Engineering Co.

5320 E. Washington Blvd., Los Angeles 22, California

Boring Tools | Reamers | Core Drills | End Mills Routers | Port Contour Cutters | Form Cutters | Milling Cutters | Special Cutters

CIRCLE INFORM-A-GRAM KEY NO. 1542

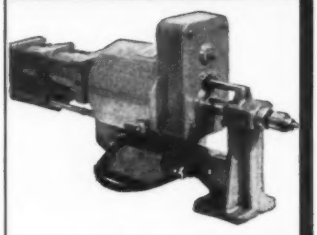
Automatic Units for CONTINUOUS SMALL HOLE PRODUCTION

FEATURES:

Instant Finger-tip Drill Speed Selection • Controlled Air Hydraulic Feed • Electric Motor Spindle • Positive Depth Stop • Rapid Withdrawal from Work If you think automation is beyond your budget, check with Electro-Mechano.

Price: NOW $295.00 (formerly $340.00)

Free Descriptive Literature



3 MODELS

.010 to ½" dia.

MODEL 111 — 3/32" Capacity
1000 to 10,000 RPM
or 2500 to 15,000 RPM
CONTINUOUSLY VARIABLE SPEED CONTROL

MODEL 113 — 1/4" Capacity
15 SPEEDS TO 15,000 RPM

MODEL 603 — 1/2" Capacity
600 to 4000 RPM
WITH VARIABLE SHEAVES

The ELECTRO-MECHANO CO.

260 E. Erie Street Milwaukee 2, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 1543

Leitz TOLERATOR THE TRU-VISION COMPARATOR GAGE

Capacity 6" Diameter

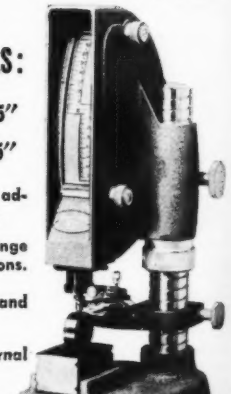
NOW AVAILABLE IN 2 MODELS:

STANDARD reading in .00005"

SUPER-PRECISION in .000025"

- Rapid quantity gaging between adjustable colored tolerance masks.
- Selective inspection from long range illuminated scale with 100 divisions.
- Variety of interchangeable anvils and contact tips.
- Instrument also available for internal gaging.

Request 8-page catalog 82-177



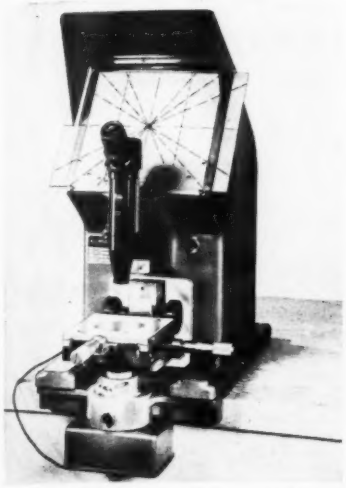
OPTO-METRIC TOOLS, INC.

137 TP VARICK STREET, NEW YORK 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1544

Product News

Small Parts Comparator



This Wilder instrument is actually a combination optical bench comparator and toolmaker's microscope for small parts work. Unit construction allows interchangeability or addition of lenses, measuring tables, illuminators, etc., at any time. Replacing the projection lens with a toolmaker microscope tube converts the unit quickly. A sliding screen facilitates zeroing to micrometer settings or quick check points in comparator work. Ask for details from Opto-Metric Tools, Inc., 137 Varick St., New York 13, N.Y., or Circle P47.

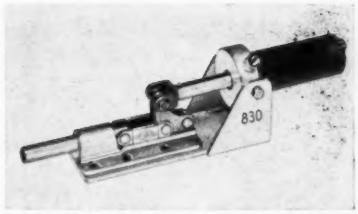
Versatile Arbor

A new one-piece, 1½" dia machinable head expanding arbor can be used on lathes, mills, grinders, drill presses and for assembly and layout work. It fits any of these machines equipped with a standard 5C spindle nose and operated by a lever action collet closer.

Arbor's fingers expand on a ball to give maximum engagement to the work's internal surface. This assures perfect concentricity and controllable gripping pressure. Request a data sheet on the arbor from Hughes Engineering Co., 1658 Superior Ave., Costa Mesa, Calif., or Circle Inform-A-Gram No. P48.

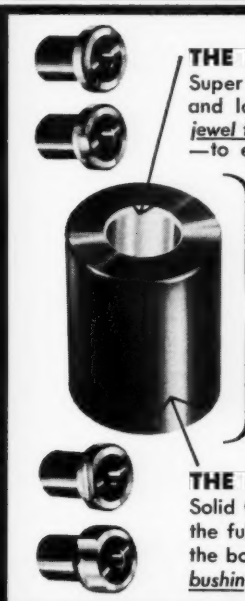
Durable Clamp

A new medium to heavy-duty, air or hydraulic operated toggle clamp with a 2500-lb holding pressure has been added to the line made by Detroit Stamping Co., 330 Midland Ave., Detroit 3, Mich. The 6-lb, 6-oz Model 830 has a 300-lb clamping pressure. Its forged alloy steel base is mounted on a steel plate for long life. The plunger, copper plated with Irrelac finish to resist weld spatter, is tapped for ⅜-16 adjustable spindle. Cylinder



restriction fittings, large diameter bearings, and heavy steel linkage assure smooth-cushioned, positive clamping action. Write the company for more data, or Circle Inform-A-Gram No. P49.

deep holes... perfect holes... with S&E solid carbide Bushings*



THE BORE
Super precision ground and lapped to a *jewel finish*— concentric —to exact tolerance.

THE BUSHING
Rigid—Solid Carbide support for *tool-control* and *long tool life.*

THE BODY
Solid Carbide bearing the full length of the bore for *long run bushing accuracy*.

S&E Bushings Cost Less With long accurate bushing life (in excess of 50 times that of steel bushings), they *cut down-time* to the minimum and *boost production* to the maximum. The result is lower bushing costs, reduced inspection time, less scrap and lower tool inventory.

S&E Bushings Perform Best Extremely accurate work can be obtained with the use of these bushings, particularly where precise size and hole location are of paramount importance, or where rigid support and alignment must be maintained. *For gun drilling*, they are considered *a must* . . . they hold the bore size longer . . . they make the tool work better.

* Standard S&E bushings meet all A.S.A. standards. They are also available in all classes of (A.G.D.) gagemakers tolerances. Special and unusual type carbide bushings are regularly fabricated by S&E.

Complete catalog of S&E products available on request.

S&E
MACHINE PRODUCTS INC.
Bridgeport, Michigan

Sales offices in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 155

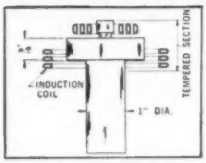
LepeL

HIGH FREQUENCY INDUCTION HEATING UNITS

HARDENING · ANNEALING · FORGING · BRAZE WELDING · CASE HARDENING · CARBURIZING · SOLDERING · BRAZING

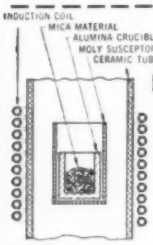
Lepel induction heating equipment represents the most advanced thought in the field of electronics . . . the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations.

TYPICAL INDUCTION HEATING APPLICATIONS



Punch Heads Selectively Tempered

Diagram shows arrangement for selectively tempering heads of alloy steel punches. The use of a combination type solenoid and pancake induction coil reduces hardness from Rc 55/56 to Rc 41/44, improving resistance to brittle fracture at the head of the punch. In this case a heating cycle of 55 seconds provides uniform tempering. A multiple position fixture, processing 4 pieces at one time, speeds up production.



Heating Non-Conducting Materials To High Temperatures

Laboratory analyses frequently require heating of non-conducting materials to temperatures of 3,000 to 3,500° F. in vacuum or special atmosphere. This can be accomplished by induction heating with the aid of a metal susceptor. Diagram shows the fusion of mica samples in an alumina crucible, using molybdenum susceptor. A ceramic tube surrounding the susceptor isolates the work for fusion in a vacuum. The molybdenum susceptor is heated by induction, which in turn, heats the crucible by radiation.

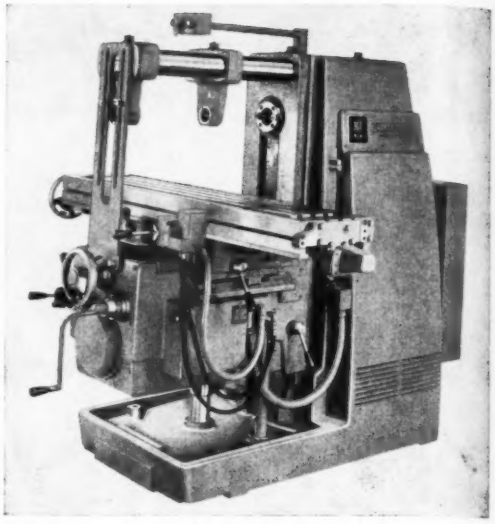
WRITE FOR NEW LEPEL CATALOG
Electronic Tube Generators from 1 Kw to 100 Kw.
Spark Gap Converters from 2 Kw to 30 Kw.

LepeL HIGH FREQUENCY LABORATORIES, INC.
55th ST. & 37th AVE., WOODSIDE 77, N. Y.

Chicago Office: 6246 W. North Ave.
CIRCLE INFORM-A-GRAM KEY NO. 1561

Product News

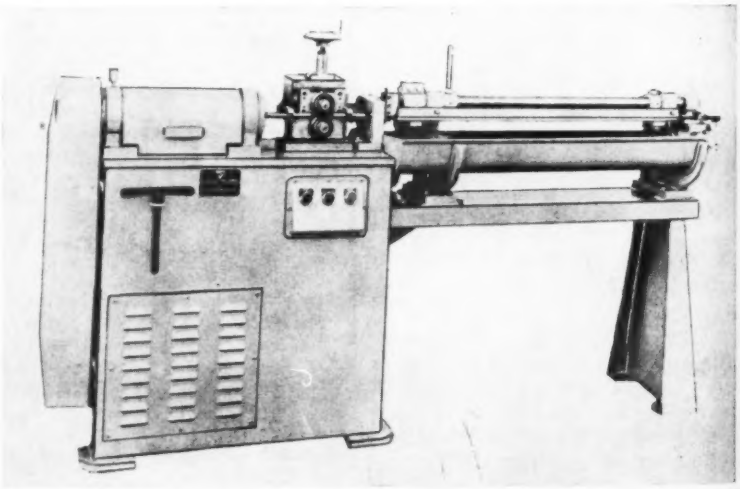
High Production Miller



Kearney & Trecker's Plain Style Milling Machine (Model 307-S12) offers automatic cycle for high production, and has been designed for maximum strength, rigidity, and accuracy, plus minimum downtime and lowest maintenance costs through unit construction. Its separate 7½-hp spindle motor provides 24 speed changes, hydraulically effected. Knee, saddle and table travels (18, 12, and 34", respectively) are powered by a separate high torque motor, providing 16 feed rates, with a rapid traverse rate of 150 ipm. With the machine's automatic cycle system, many table cycles may be quickly and easily set up to attain the highest production rate. Write to Kearney & Trecker Corp., 6800 West National Avenue, Milwaukee 14, Wisconsin for more data or Circle No. P50.

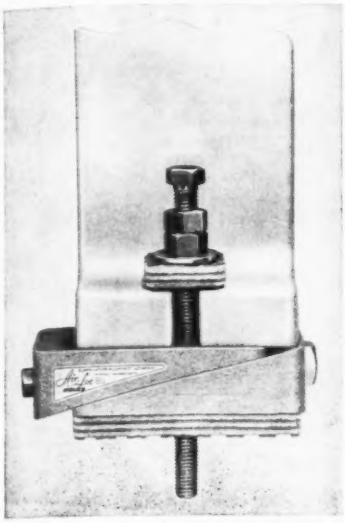
Wire Straightening

Automatic wire straightening and cutting are done by this Shuster Model 1V18 that handles wire from 1/16 to 1/8" dia. It can deliver 200 cuts/min, up to 8" long. Features include a high speed straightening arbor, five elongated and ball-bearing mounted split dies, a variable speed unit for infinite feed ranges from 25 to 150 fpm, and a solenoid-operated roll clutch. Write for further data to Mettler Machine Tool Inc., Box 883, New Haven 4, Conn., or circle Inform-A-Gram No. P51.



Product News

New Machine Mount



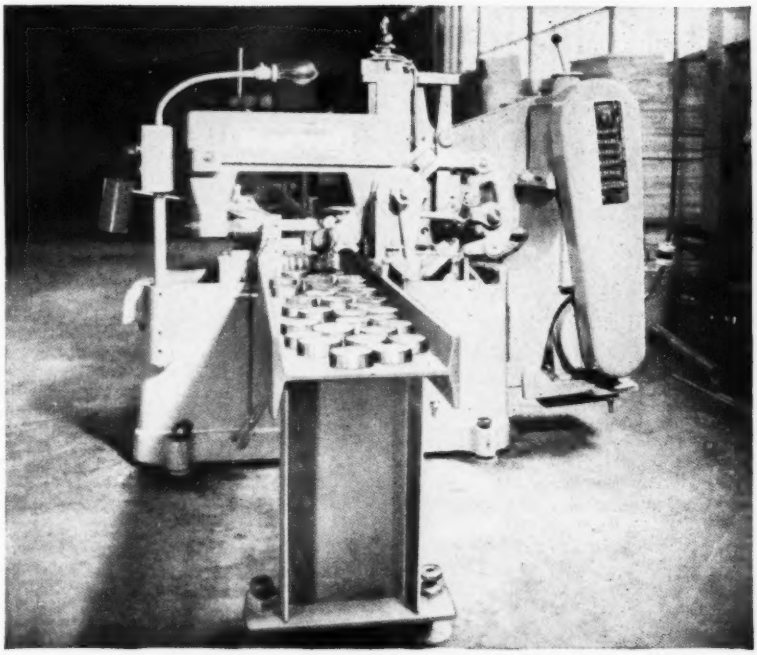
Vibration control and quick machine leveling are accomplished by this new machine mount. It's designed for use where bolting of machines to the floor is required by safety codes, and its installation requires no bolts or cement. Double wedge construction facilitates simple leveling. For further information about the Bolt-Thru Wedgmount write to Clark, Cutler, McDermott Co., 8 W. Central St., Franklin, Mass., or circle Inform-A-Gram No. P52.

Short Power Drills

A series of short power drills in fractional and wire gage sizes is now offered by Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. They're of the same specifications as screw machine drills, except that their specially designed heavier webs make them

particularly suitable for use in portable machines. They're recommended for drilling truck and auto bodies, sheet metal and stainless steels, as well as general purpose drilling. Write the company, or circle Inform-A-Gram No. P53.

BUY U. S. SAVINGS BONDS



Payoff End of a Production Marvel

A cut-off saw's value is proven at the discharge end of the machine. How quickly the trough is filled with accurately cut-off pieces can mean the difference between profit and loss on many jobs.

The R. J. Sudrick Co., Des Plaines, Illinois, manufacturers of precision aircraft components had to cut-off 4600 blanks from 3¼" round, 303 Stainless Steel Bars.

They bought our MARVEL No. 6A4 High Speed Heavy Duty Automatic Bar Feed Hack Saw Machine; used MARVEL High-Speed-Edge Hack Saw Blades, and got the high production, accuracy and economy they desired.

PRODUCTION? Constant at 20 pieces per hour floor to floor

ACCURACY? Held well within the permissible tolerance of +.010 —.000

BLADE COST? Just 1¼¢ per cut. Only twenty-three MARVEL blades were needed to make the 4600 cuts, and not a single blade failure due to blade breakage. MARVEL High-Speed-Edge Blades are unbreakable.

The point is this: MARVEL Metal Cutting Hack Saws equipped with MARVEL High-Speed-Edge Hack Saw Blades are an unbeatable combination for economical, accurate and safe cutting-off.

If your hack saws are not producing the economy you need to meet today's competition, try MARVEL High-Speed-Edge Blades. They will give you the competitive edge every time. Write for Catalog C-85 which has the complete story on MARVEL Hack Saws and Band Saws, Hack Saw Blades and Band Saw Blades.

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

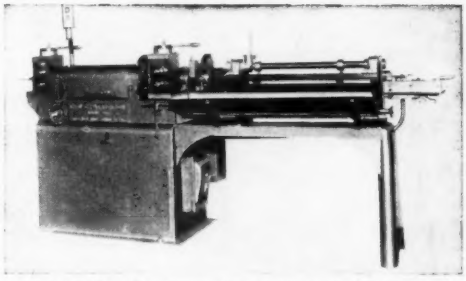
MARVEL Metal Cutting SAWS

CIRCLE INFORM-A-GRAM KEY NO. 1571

TRANSIT-CUT WIRE STRAIGHTENING CUTTING MACHINES

REELS--HI-HATS

VARIABLE FEED
—For Greater Production
ELECTRIC TRIP
—For Greater Range
TRANSIT-CUT
—For Greater Quality
TWO FEED HOUSINGS
—For Greater Pull



Model 12A—Continuous Feed 1/16" to 1/4" Diameter

ON THOSE NEW 1000# COILS, Other models for ¼" to ½" diameter

Write to Dept. 12A for Literature.

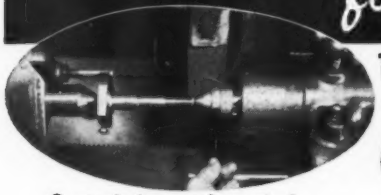
The Geo. C. Patterson Machine Co.

3409 TRUMBULL ST., CLEVELAND 15, OHIO • BRoadway 1-1808

CIRCLE INFORM-A-GRAM KEY NO. 1572

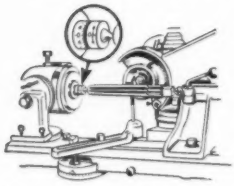
NEW . . . fast, easy CENTER ALIGNMENT

for GRINDERS

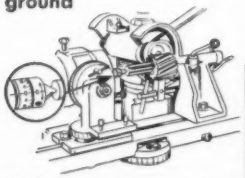


Center being used on grinder

The Enco Micro-Set® Adjustable Center



Taper reamer being ground



Helical milling cutter being reground

- permits TRUE work alignment from tailstock or headstock on: cylindrical grinders, cutter grinders, gear shavers, lathes and tracer attachments.
- Saves one half the set-up time.
- Ends hit or miss table adjustments to obtain precise alignment.
- An inexperienced operator can get a precise alignment—easily—in seconds.
- Quickly pays for itself in time and scrap savings.

Morse Taper	Brown & Sharpe	Jarno
#2 $49.50	#6, #7 $53.00	#6, #7 $53.00
#3 61.50	#8, #9 65.00	#8, #9 65.00
#4 76.00	#10, #11 85.00	#10, #11, #12 85.00

Write for catalog and nearest distributor.

Enco MANUFACTURING CO. *We also manufacture Precision Lathe Turrets and Tiny-Titan Magnetic Base Holders.* Dept. No. 711C, 4520 W. Fullerton, Chicago 39, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1581

WHY WAIT? IMMEDIATE DELIVERY!

LARGEST STOCK OF

SPECIAL RH & LH Taps-Dies & Thread Plug Gages

Also in Stock:
- RING GAGES • ACME & METRIC TAPS & DIES
- SPECIAL REAMERS
- EX. LONG DRILLS

Write Today for WALL CHART Special Taps Also Made to Your Print Specifications

Quotations on Request

FIELD TOOL SUPPLY CO.
Industrial Cutting Tools
31 S. DESPLAINES ST., CHICAGO 6, ILL.
All Phones: Financial 6-1195

CIRCLE INFORM-A-GRAM KEY NO. 1582

Every Shop Should Own One

13.50

No distortion — even on ⅛" stock!
MODEL "C"

KNURLMASTER Hand Knurler

For small production runs on ⅛" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

ROCKWIN MANUFACTURING CO.

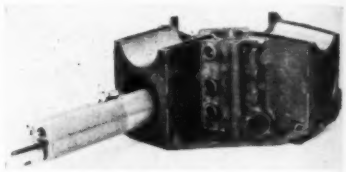
80A MAGNOLIA AVE., WESTBURY, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1583

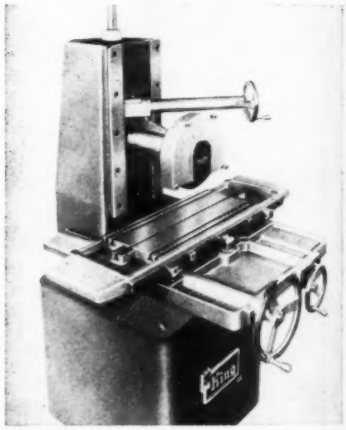
Product News

Internal Measurements Simplified

A new internal linear piloter has extended the versatility of the Proficorder made by Micrometrical Mfg. Co., Ann Arbor, Mich. The Proficorder is an electro-mechanical instrument for measuring and recording flatness, roundness, waviness, etc., of machined or finished surfaces. The piloter enables measuring in out-of-the-way places like round, square, rectangular and triangular shaped holes. Request literature from the company, or circle Inform-A-Gram No. P54.



Manual Surface Grinding

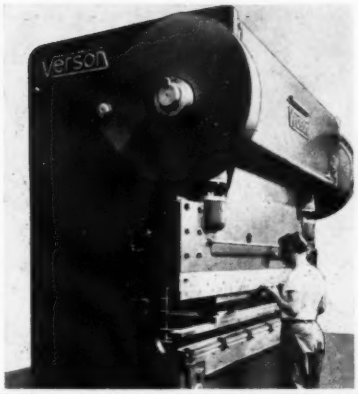


Model K-1020 is designed for manually-controlled wet or dry surface grinding. It has a 20" longitudinal table travel and a 14" cross feed. The 12" grinding wheel diameter allows a 15" vertical clearance over the table. T-slotted table travels on precision ground ways, has adjustable stops and a 10" x 20" working surface for wet grinding. The direct-drive spindle rotates on preloaded ball bearings, and is powered by a 1½-hp motor. Get literature from King Machine & Mfg. Co., 1171 E. 32nd St., Los Angeles 11, Calif., or circle Inform-A-Gram No. P55.

Product News

Press Brake Drive

Dual speeds highlight this press brake drive. The new drive advances the ram rapidly, then slows it before work is contacted, allowing higher production rates without the danger of high forming speed. The slower forming speed slows the travel of the sheet's end as the bend is made, then return of the ram is at the higher speed.



The dual speed drive is available on all larger Verson press brakes. Get more data from Verson Allsteel Press Co., 9300 E. Kenwood Ave., Chicago 39, Ill., or circle No. P56 on the Inform-A-Gram card.

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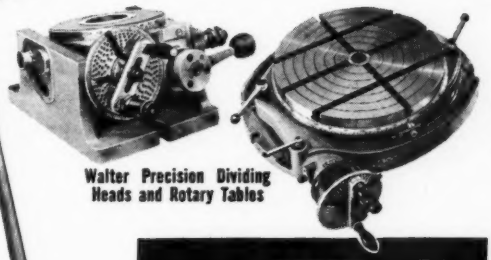
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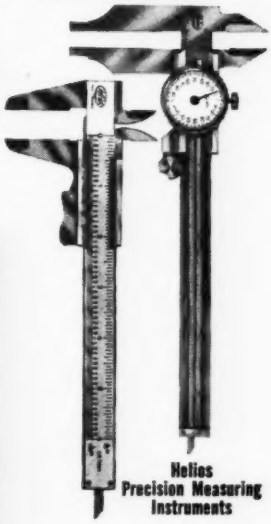
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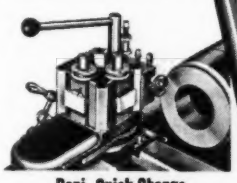
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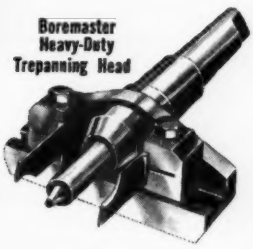
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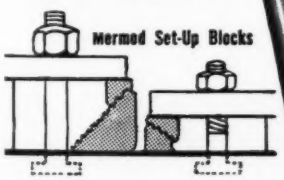
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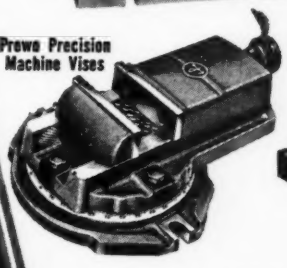
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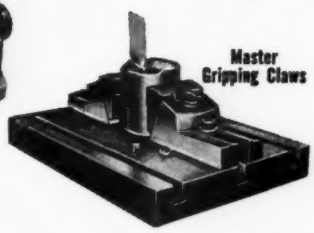
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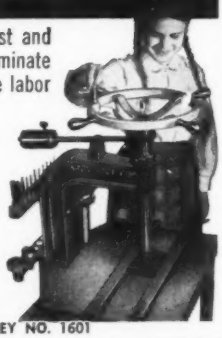

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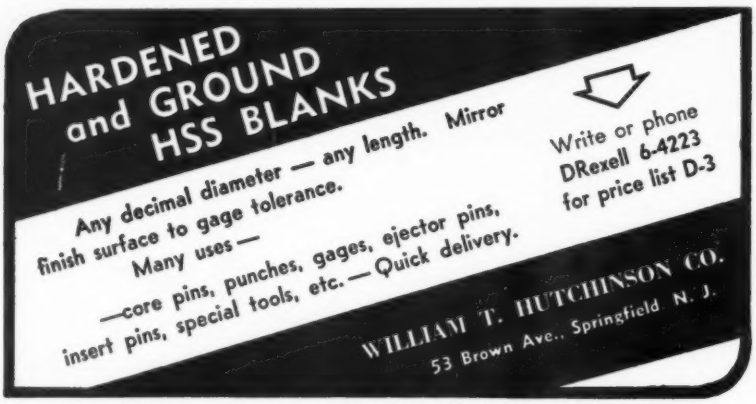
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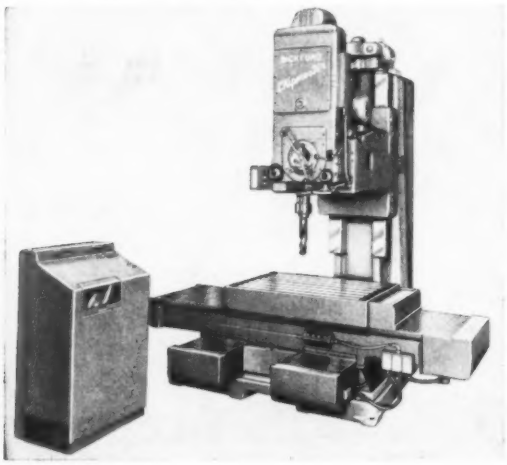

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Product News

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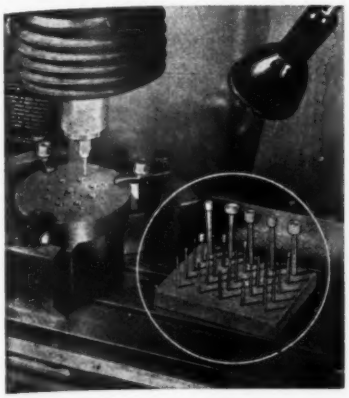

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This standard consolidates and supersedes three former standards: Involute Splines, B5.15-1950: Involute Serrations, B5-26-1950; and Involute Spline and Serration Gages and Gaging, B5.31-1953.

Copies of "Involute Splines, Serrations and Inspection, B5.15-1960," are available at $5 each from the American Standards Assn., Dept. PR196, 10 East 40th St., New York 16, N.Y., and ASME 29 West 39th St., New York 18, New York

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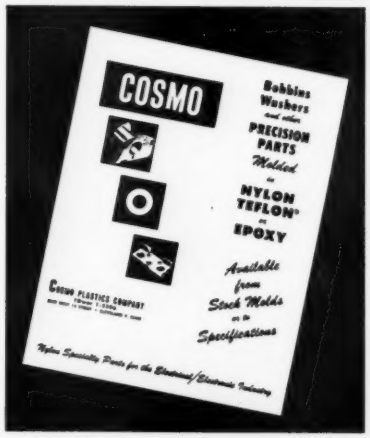

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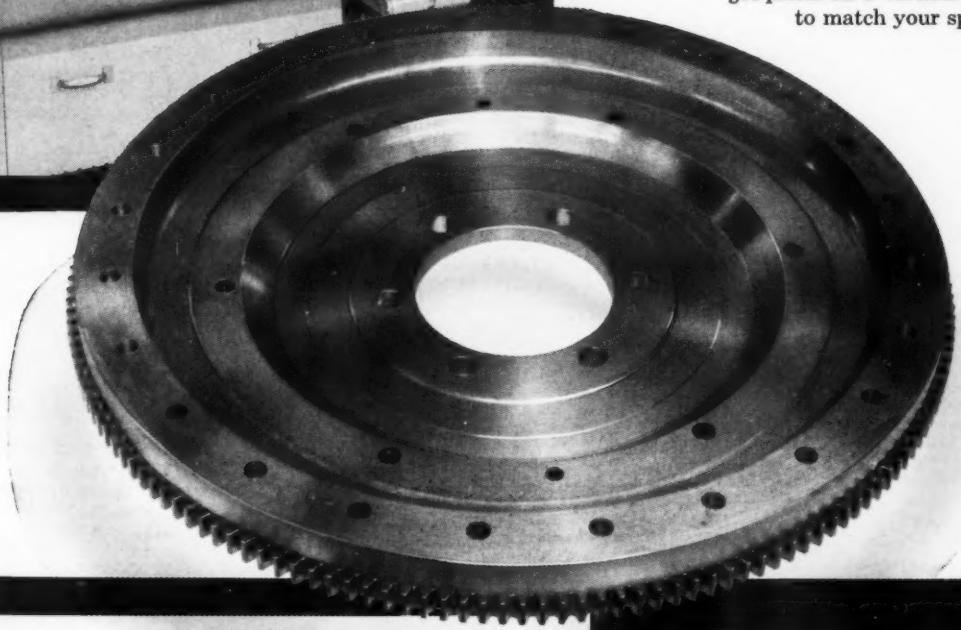

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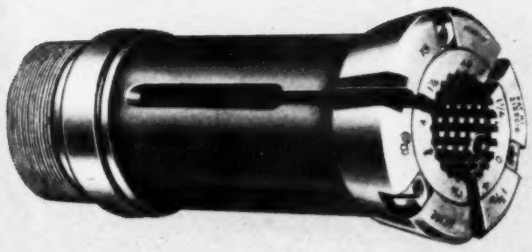

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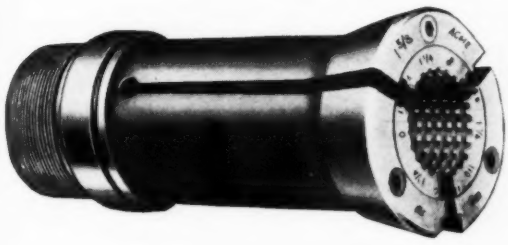

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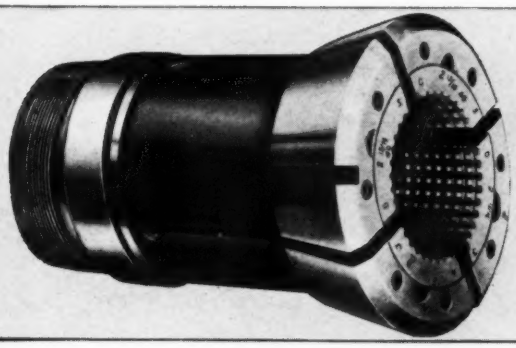

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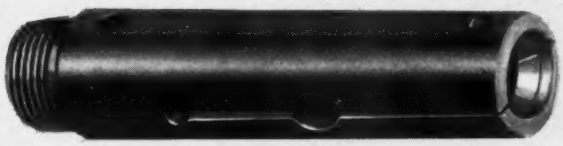

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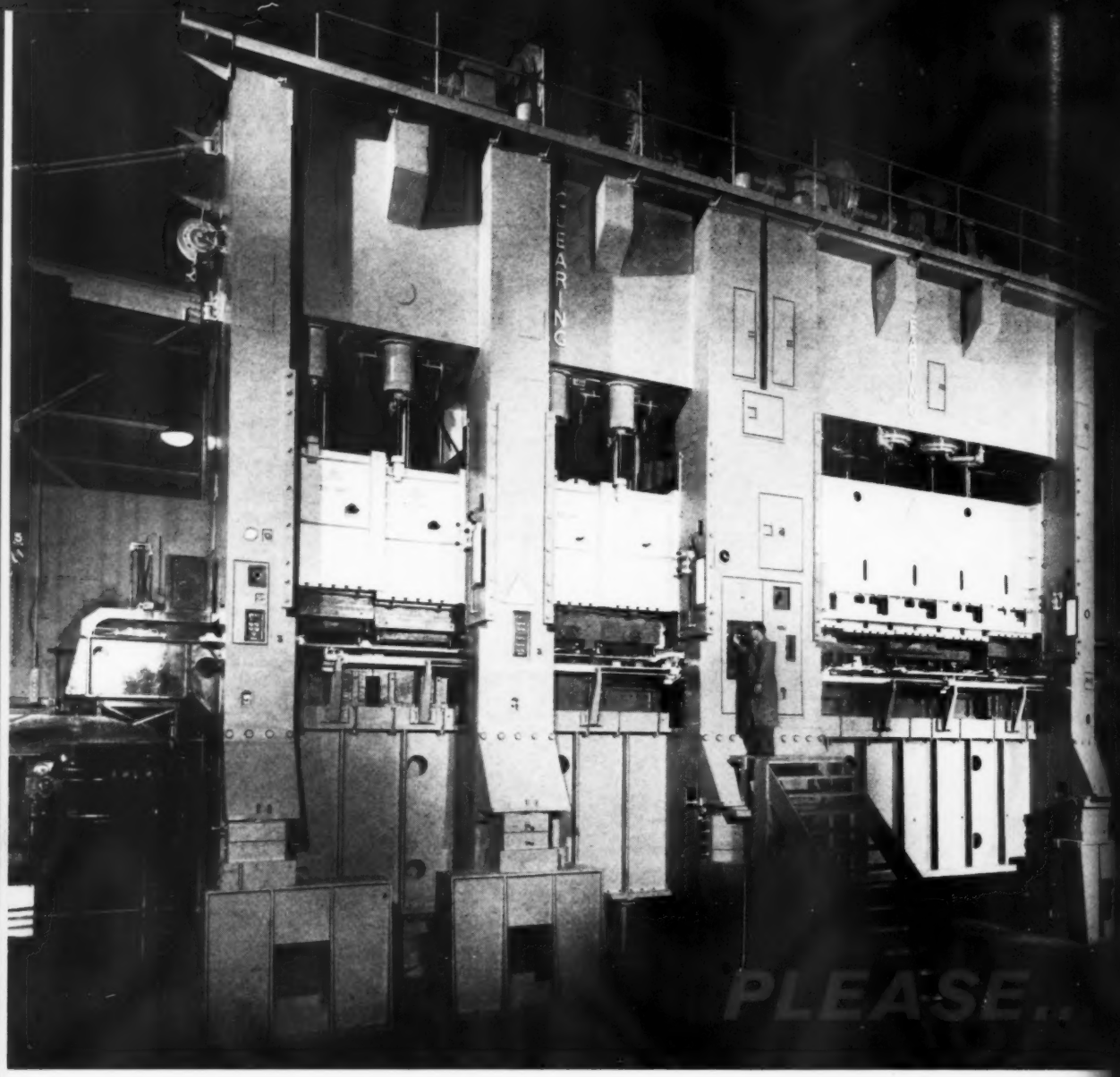

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